The Builder.

SATURDAY, JANUARY 27, 1855.

WE have before us Mr. Muirhead's new book on Watt and his Mechanical Inventions.* James Watt, the developer of the powers of steam,—the magician, by the play of whose iron rod the unprecedented manufacturing and naval steam powers of this country may be said to have been evoked,—was born at Greenock—the Gravesend of Glasgow,—upwards of a century since; and even from his childhood, like not a few others destined to scientific greatness, appears to have been cut out, as it were, for the work he had to do; the main bent of his life, it may have been, having assumed form and consistency from one of the first efforts and gratifications of his peculiar mechanical talents, while yet a child; since it is recorded, and has been specially remarked by M. Arago and others, that one of his boyish speculations actually consisted in the *condensation of steam in a separate vessel.* His call to be a mechanical philosopher, too, as a living relative, Mr. Muirhead, also thinks, may have been all the more impressed on his mind by the presence, in his father's house, of somewhat notable portraits of Napier and Newton. True it is, at all events, that he early began to show that he was "no common child." Ill health and homely tuition, moreover, may have helped to induce habits of quiet and solitary meditation.

Watt's mind appears to have begun early to yearn after wider fields of experience than his own humble birthplace afforded; and he soon found his way from Greenock to Glasgow, and from Glasgow to London, where he was further prepared for his important destiny, by learning the art of mathematical instrument making; after which he returned to Scotland, and being (fortunately, doubtless, there as well as in the City of London) prevented from setting up in business on his own account, not being a freeman either in the City of Glasgow or in that of London, he was glad to embrace the opportunity which a very humble opening at first presented him of doing something for himself in the way of his business as a mathematical instrument maker, under the *quasi* sanctuary of the Glasgow University, whence no city corporation or its freemen could expel him. The little incident which occasioned his first introduction to this seat of learning is modestly described by himself in a letter to his father, dated 25th October, 1756, in which he says, "I would have come down [to Greenock] to-day, but that there are some instruments that are come from Jamaica that Dr. Dick desired that I would help to unpack, which are expected to-day." Now, it is a singular circumstance, we cannot but think, that Watt,—already a most original and inquisitive mechanical genius,—a "queer lad,"—a curious boy,—thus was placed, by apparently the most fortuitous and trifling circumstance, in a position where, shortly afterwards, the now celebrated, but in itself primitive and faulty, model of Newcomen was presented to him by the University authorities "for repair," and where he also, about the very same time, became intimately acquainted, and associated in scientific friendship, with the discoverer of latent heat, the celebrated Dr. Black, who, in that very year, was appointed professor of anatomy, and lecturer on chemistry, in that very college! And that there too, through Dr. Black himself, Watt was introduced to the practical originator of the manufacture of iron by means of coal in place of charcoal, namely, Dr. Roebuck, who, moreover, assisted pecuniarily in the development of Watt's grand idea, until he was handed over, as it were, by Roebuck, to Boulton, Birmingham, and universal fame. Who will say there was not a special disposal of events and circumstances here? Dr. Black's discovery was an essential element in Watt's calculations as to the capabilities of steam. Dr. Roebuck's was an essential preliminary to that vast multiplication of "Watt's Fire-engine," as it was called, and its multitudinous manufacturing and other purposes, which have since made this country the world's workshop and its centre of mechanical power.

Dr. Black, in a MS. narrative, never, it is believed, quoted or noticed by any biographer of Watt except Mr. Muirhead in his recent work, thus describes the germ, as it were, of the grand inspiration of Watt's life:—

"It was in the beginning of the year 1765, that the fortunate thought occurred to him of condensing the steam by cold in a separate vessel or apparatus, between which and the cylinder a communication was to be opened for that purpose every time the steam was to be condensed; while the cylinder itself might be preserved perpetually hot, no cold water or air being ever admitted into its cavity. This capital improvement flashed on his mind at once, and filled him with rapture."

Watt himself even indicates the very spot where this "rapture" so suddenly inspired him. On being asked, in 1817, if he recollected how the first idea of his great discovery came into his mind, the old man instantly replied,—

"Yes, perfectly. One Sunday afternoon I had gone to take a walk in the Green of Glasgow [where many a one besides Watt has meditated amongst its trees or beside its *pearl-yielding* Clyde waters, or by night in the strange glare of its neighbouring ironworks], and when about half way between the Herd's House and Arn's Well, my thoughts having been naturally turned to the experiments I had been engaged in *for saving heat* [*latent* in or constitutional to the state of steam, and absorbed from the fire, as Dr. Black had taught him to believe] in the cylinder, *at that part of the road* [and Sunday as it was, when the mind of young graceless, as his revered and kirk-going father might perhaps have said at the time, should have been not "naturally turned" or inspired, but spiritually], the idea occurred to me that as steam was an elastic vapour, it would expand and rush into a previously exhausted space; and that if I were to produce a vacuum in a separate vessel, and open the communication between the steam in the cylinder and the exhausted vessel, such would be the consequence."

This interesting little detail reminds us of Galileo's observation of the pendulum, while in the cathedral at Pisa, where, in place of being engaged in devotional exercises, he happened to be gazing vacantly upwards at a lamp which swung from the roof, and which instantly inspired his mind as it were with the idea of continued pendulations in equal times.

Poor as Watt then was, this was doubtless the very happiest moment throughout a long life, seared by what he bitterly, and but with too much truth, complained of in after years as the "villanies," the "rascalities," of his fellow men,—the Hornblowers, Bulls, and others who lived upon his laborious thoughts, and vexed his soul with law-suits and slanders. Watt, however, was a man of far too practical and matter-of-fact a kind not to "mind the main chance," as some of his countrymen would say. The turning of his various inventions to profit ever occupied his attention, co-ordinately with his more disinterested scientific thoughts. Even after he had been taken by the hand and into partnership by his staunch and far-seeing business friend, Boulton, it was not a few weary years ere fortune really smiled upon the co-partners. The introduction of the improved engine into Cornwall, its most promising field at that time, seems to have been a sickening business to Watt, who had to go personally to the district, and hammer his ideas into thick skulls—a poor exchange, in his opinion, for the intellectual pleasures of the "Lunar Society," with its Darwin, Priestley, *et hoc genus omne*, and the hospitable society of Soho and its vicinity. How little the real merits of machinery were appreciated by those among whom he had thus to labour, and how much indeed "Watt's fire-engine," in its maturer forms, was needed at that time, appears from an amusing description he has given even of one of the first of his own engines there erected. "The velocity, violence, magnitude, and horrible noise of the engine," he says, writing to his copartner, Mr. Boulton, "give universal satisfaction to all beholders [and auditors, he should have added], believers or not. I have once or twice trimmed the engine to end its stroke gently and make less noise, but Mr. —— cannot sleep unless it seems quite furious, so I have left it to the engine-man. And by the bye, the noise serves to convey great ideas of the power to the ignorant, who seem to be no more taken with modest merit in an engine than in a man." As for "the engine-man," Watt complains that "he actually ate the grease for the engine."

At this very time, or rather before it, an offer was made him, which might have immensely affected the destinies of this country, and might have even reversed our position with relation to Russia, and have rendered the probability of a Russian steam invasion, at this moment, of our own less well protected shores, by no means preposterous. Mr. Boulton, honest man, had been "sounding the praises" of his gifted coadjutor at the Russian Ambassador's, and the very speedy result, at that critical moment (the spring of 1775), was an offer of employment, with 1,000*l.* a year, under the Russian Government. Mr. Boulton was "staggered," "repented" his rashness, expatiated on the "dangers of so long a voyage or journey," and kindly reminded the bear-hugged philosopher of "the precariousness of your health." "Lord! how frightened I was," exclaimed Dr. Darwin, "when I heard a Russian bear had laid hold of you with his great paw, and was dragging you to Russia! Pray *don't* go, *if you can* help it. Russia is like the den of Cacus: you see the footsteps of many beasts going thither, but of few returning. I hope your fire-engines will keep you here." Well it was for his then thankless and almost unconscious country that his fire-engines did keep him here. Had the offer not been only just a little "*trop tard*," the empire of the Russ, and not of the Briton, might have been at this moment the great steam engineering centre of the world. Nor was this the only opportunity which Russia seized, as if to the full extent conscious of the immense importance of such an endeavour to get ahead of us. A previous attempt to engage Watt's services on behalf of Russia had been made in 1773—two years before—through his friend, Dr. Robson, late of Edinburgh, but then of Russia. Again, even so long afterwards as 1816, Nicholas himself, then Grand Duke, actually applied *in vain* at the Soho works for permission only to view the interior, his application backed by a letter from Lord Sidmouth, of which the great Nicholas was the humble bearer! *There were certain persons in his suite who had other objects than merely to "view the interior!"* Cunning and unscrupulous then as now! In 1775, Watt, it is verily believed, would have actually seized the opportunity of earning so handsome a salary as 1,000*l.* must have then been to him, had it not been that he was alarmed by the hint that Captain Perry, another engineer, whom the

* "The Origin and Progress of the Mechanical Inventions of James Watt; illustrated by his Correspondence with his Friends and the Specifications of his Patents." By J. P. Muirhead, M.A. In three volumes. London: Murray, Albemarle-street. 1854.

Czar Peter had engaged, had to fly for refuge to the British ambassador, and to return to England without receiving the pay due to him. Watt therefore decided to prefer to such "despotic predilections" the to him more secure, and to us more fortunate destiny of "a crust of bread and liberty."

James Watt, as is well known, was the author of many other inventions besides those connected with the steam-engine, in themselves a host.*

He had actually suggested the marine screw-propeller, one of the newest adjuncts to his own admirable engine. His friend, Dr. Small, having mentioned to him in 1770, the desire which Mr. Boulton (not then a partner of Watt) entertained of moving canal boats by help of the steam-engine,—"Have you," said Watt, in his reply, "ever considered a spiral oar for that purpose, or are you for two wheels?" The contradistinction between two wheels and one oar, plainly implies the idea of substituting the screw for the tapering oar at the stern of the boat. Mr. Muirhead, who first brings this fact before the public, instances it very justly as one of the many extraordinary proofs that Watt's genius and sagacity were far ahead of his age; but he is wrong in supposing, as he appears to do, that Watt was thus the first projector or originator of the screw as applied to ships; for it is known that in China, from time immemorial, the screw has been so applied, a fact, however, doubtless quite unknown to Watt.

Even in his early youth, so fertile, so varied, and so brilliant was the admitted mechanical and inventive genius of Watt, that, although he was well known, among his acquaintances, to have "by nature, an absolute deficiency of all musical ear," as well as a total want of all experience or education in organ building, some of these very acquaintances, who formed a Masons' Lodge at Glasgow, and wanted an organ, applied, with the utmost confidence, to Watt to make them one, as he was up to anything! And Watt did make the organ according to order, although, when he began, he did not know one musical note from another; and not only did he make a good job of it apparently, but in the course of his preliminary experience "a thousand things occurred to him which no organ builder had ever dreamed of,—nice indicators of the strength of the blast, regulators of it, &c. &c." and he mastered the theory of the beats of imperfect consonances, so as to tune the organ himself though devoid of ear, and to the delight and astonishment of the best performers; invented a real monochord of continued tone, and made an observation, while playing with this, which it is alleged would have terminated a dispute between the first mathematicians in Europe,—Euler and D'Alembert,—and which completely established the theory of Daniel Bernouilli, who differed from both about the mechanism of the vibration of musical chords, and as completely overturned the theories of Rameau and Tartini.

The perspective drawing machine was another invention of Watt's, of date about 1765. He invented the micrometer for measuring distances; and, indeed, he acted practically as a civil engineer, having made a chart of the Clyde, and surveys for the Forth and Clyde, Monkland, and other canals, and even produced the first survey for the great Caledonian Canal across a chain of lakes in the north of Scotland, and of which Telford, in his subsequent survey, acknowledged that he made good use. He invented the copying machine, for which and other improvements, he took out successive patents. He specified in his patent of 1784, improvements in the principles and construction of steam-engines for wheeled carriages, and a working model of a locomotive engine was actually made by one of his subordinates, Mr. Murdock. Watt's mission, however, was mainly to set the improved steam-engine agoing; and although he foresaw at least its possible utility in locomotion, both by land and sea, he had not the means or opportunity of doing more than merely bringing the engine itself into use, for fixed or local purposes. True, he was in the habit of expressing doubts about the probability of using locomotives at least on common roads, but a letter *to* Watt from one of his own friends, Mr. Edgeworth, may afford us a glimpse into his own private, innermost, and most speculative thoughts. "I have always thought," said Edgeworth, "that steam would become the universal lord, and that we should in time scorn post-horses. An iron railroad would be a cheaper thing than a road on the common construction." This, however, was not written till 1813, but it was even then a clear prophecy of times to come.

In 1785, Watt had turned "some of his idle thoughts to an arithmetical machine,"—a grand idea, but too much seemingly even for a mono-theorist, if we may judge by the void result of Mr. Babbage's life-time efforts. This was by no means a mere vague speculative idea of Watt: he did much to mature his idea to a certain extent, though not to realise it into an actual machine.

Watt's inventions began with rough power: they appropriately ended with refined art. One of his latest occupations in life, consisted in the gradual perfectment of a machine for making solid copies of statues or other sculptures, a most ingenious invention, the idea of which was suggested to him by an implement he had seen and admired at Paris, in 1802, where it was used for tracing and multiplying the dies of medals. This new machine was to do for solid masses, and in hard materials, wood, ivory, soft stone, and even marble, what his copying machine of 1782 had already done for drawings and writings on flat surfaces of paper. In 1808, its construction was considerably advanced, so that his glyptic machine, as he then called it, had become polyglyptic, or capable of cutting two or more copies at once, though "still far short" of his ideas; but in 1818 he had not only completed this favourite occupation of his old age, but was on the very eve of patenting the invention, when he felt the hand of death upon him, and in that very year he died, after having exhibited the machine to some favoured friends, and so prevented the appropriation of it by others to their own exclusive patented benefit, but leaving it, as it were, a legacy to society.

The work mentioned at the commencement of this notice, is a highly interesting one. The first volume of it is mainly devoted to a memoir of Watt; the remainder of that volume, and the whole of the next, to his correspondence; and the third volume to the specifications, &c. of his patents. The form of the whole work is more expensive than it ought to have been; but doubtless there will be other editions in course of time, which will bring it into more general distribution than the present may obtain.

The author of the memoir writes most affectionately of the subject of his notice, and calls him, as Plato did another sage, "The most virtuous, the most wise, and the most just." He does not forget to record the statue erected in Westminster Abbey by the nation, not merely, as Lord Brougham has said, "to perpetuate a name which must endure while the peaceful arts flourish; but to show that mankind have learned to honour those who best deserve their gratitude;" and he refers with satisfaction to the medal struck by the Art-Union of London in honour of Chantrey (*sculptor et artium fautor*), which bears on the reverse his monument to JAMES WATT.

* Though not to be classed among his *inventions*, albeit Dr. Black's discovery of latent heat is by Watt himself called an invention, we must not fail to note his *discovery* of the composition of water, once attributed to Lavoisier and Cavendish, but by the verdict of such a scientific *jury* as Davy, Henry, Arago, Brougham, Dumas, Berzelius, Brewster, and Liebig, finally ascribed to Watt.

REVIEW OF THE PLANS FOR THE DRAINAGE OF THE METROPOLIS NOW UNDER CONSIDERATION.*

CONTINUING our remarks upon the salient points in the schemes and evidence now before the Commission, attention should be directed to the opposite treatment of two sections of the northern area, namely, drainage *out* of the areas to Barking-creek, and drainage within the area as by Chelsea. Eighteen square miles of drainage converge to a sumpt near Chelsea, by means of two enormous parallel sewers, because the level of the district is so low that it is impossible to obtain any other natural means of drainage than into the river as at present. At the same time it is proposed to send the drainage of sixty-five square miles (forty-one north and twenty-four south) from areas equally low in large tracts, from Chelsea near to the commencement of the sumpt system; and from points on the south side beyond the sumpt miles to the east to Barking and Deptford Creeks.

Sir William Cubitt would have all the sewage go into the Thames,† and would show the gentlemen who are so anxious to turn it into valuable manure, that "there is a means of doing it out of the fifty sewers at a little distance back far better, and, in his opinion, much cheaper than they could work this great thing (the tunnel sewers), which they talk about, but will never do." "All people who go in extremely large steps at one time must, he thinks, occasionally fail." He should recommend that at every one of the fifty main sewers an establishment should be erected, by means of which they would work more certainly and more economically, and would get rid of all the rain-falls easier than by this large thing which they talk about doing. "You quite mistake me," he says, "if you think I have come here against saving the manure and making it available."

It is proposed now to notice some points in Messrs. Bazalgette, Stephenson, and Cubitt's review of Mr. John Roe's scheme, or rather their confirmatory observations in favour of their own schemes, "approved of by us in our former reports," in contrast with it.

Messrs. Stephenson and Cubitt object to Mr. Roe's datum of 31,000 inhabitants per square mile:‡ they call it a serious error, affecting the capacity of his middle level line; for, say they, the population is from 80,000 to 100,000. In an important part of Mr. Roe's plan, "which proposes to deal with the interception from an area of 28 square miles, out of a total of 41, through the middle intercepting sewer alone," Messrs. Bazalgette and Haywood's tables, accompanying their Report of Jan. 21, 1854, will on this point (as Sir William Cubitt says, speaking in terms of general approval) "well repay the perusal."

In the three tables, the heading of the column governing their sizes (as to prospective population) is uniformly thus "prospective number estimated at 30,000 per square mile." So that the very proof of error is an emphatic condemnation by themselves of the accuracy of their own tables. The figures under this heading are certainly widely at variance with the heading in many cases; the three main lines giving the following results:—

	Present Number.	Prospective Number estimated at 30,000 per Square Mile.
	Per Square Mile.	True Number per Square Mile.
Table 1. Northern High Level, or Hackney-brook...	6,575	29,682
„ 2. Middle Level	48,888	57,157
„ 3. Main Low Level	58,636	61,550
		Prospective Number.
Summary of Table (including these lines only).....	37,055	49,102

But neither in the case of the present nor of the prospective population do these (averaged) tables bear out Messrs. Stephenson and Cubitt's implication of Mr. Roe's middle level "dealing with the interception from 28 square miles" being inadequate for its work, through its wrong basis of 31,000 instead of 80,000 to 100,000 per square mile. They seem to ground their deductions on isolated sections of the area dwelt with, giving *maximum* results; whilst they wholly suppress the important facts that one-fourth of Mr. Roe's middle level area has an average present population of only 6,575 per square mile (Table No. 1); and that the mean present population of the whole metropolitan area treated by Mr. Roe is only 37,055 per square mile. (Summary of Tables.)§

Assuming Mr. Roe to have erred by deduction

* See p. 28, *ante*.
† Evidence, 3414.
‡ Report, Dec. 11, 1854, pp. 27, 28.
§ Report, Jan. 21, 1854.

from a minimum datum (Messrs. Bazalgette and Haywood's tabulated heading), the Commissioners' acting and consulting engineers may certainly take credit for being on the safe (?) side, when they increase the inhabitants of fields and bleak waste, from a rate of 366 per square mile, to a rate of 30,000 per square mile, or more than eightyfold,* propound a scheme for two or three main lines, for the suburban district of which it forms a part, which no amount of rate collectable from it, in its present condition, could ever repay.

The reporters say that "the above conclusions will afford sufficient explanation of the data upon which the sizes of our intercepting sewers are calculated. The *details are given in Appendix A.*" Appendix A. constitutes the tables.

Mr. Stephenson says, "With reference to the dimensions of the proposed sewers, I have not been able to go into the details of the calculations, but having examined the *tabular* statements attached to the engineers' report, and having received explanations from them respecting the directions of the flow in the various sewers intended to take place, I have every confidence in the correctness of their conclusions."†

Some doubt must be felt as to the value of these tables professing to be amplifications of the report, when we find these startling anomalies in three main lines;—a 12 feet 6 inch sewer falling 1 in 1,359, taking less than a 9 feet 6 inch sewer, falling 1 in 3,520; and taking one third less than a 10 feet sewer, falling 1 in 2,640, under precisely the same heading of "Rainfall per minute, and maximum sewage per minute added together."

Messrs. Stephenson and Cubitt‡ strongly object to the limitation of Mr. Roe's Hackney-brook scheme, because it does not relieve any other existing outlets into the Thames; because it is simply a district sewer for an area which has hitherto never drained into the Thames, through London; because it does not extend, as does Mr. Bazalgette's and their schemes, towards Kilburn. "The omission [they say] of the extension of the Hackney-brook sewers, towards Kilburn, we cannot help thinking *is a fundamental error*, for it throws the entire drainage of the northern district of the metropolis into the middle intercepting sewer, which ought to be kept down in dimensions as much as possible."

Mr. Stephenson, the consulting engineer of the Commissioners of Sewers of to-day, curiously enough, in this condemns Mr. Stephenson, the Commissioner of Sewers, 1850-1; for Mr. Forster's scheme approved, and in part designed by him, is certainly obnoxious to this "fundamental error."§ But after all, everything about this extension, shows its indefinite character. Its route is dotted on the plan. The tables, showing in all other cases these particulars with minute precision, fail to give the length, the rate of inclination, and the size of the sewer; and Mr. Stephenson's very argument in the sequel would point to its fixity as an afterthought.

With a view to add force to their objections to Mr. Roe's 4-feet lower outlet, they say, basing their arguments upon Mr. Forster's‖ experiments in 1851, in the tidal flow, "But in discussing this part of the question, we cannot feel justified in disregarding Greenwich and its populous neighbourhood." The force of this care for the verge of populated London; of this fear, lest the sewage of the north side of London, discharged, as they say, some 4 feet lower than they would go, and under high water for some short period, some six or seven miles below Greenwich, should chance to flow up the river and reach this devoted town, are somewhat impaired by contrast with their own scheme for the south side, in which they propose to send some 24 square miles of foulest drainage of more than half a million of people, and innumerable noxious factories, into the very heart of this very town of Greenwich.¶

Mr. Roe's syphon under the River Lea, is objected to, because, say they, it will probably be converted at times into a reservoir, and because it will thus become liable to accumulate deposit.** But how do the reporters themselves propose to pass the Lea near this point?

With remarkable explicitness, they say, "Thence it (the Hackney Brook Sewer) crosses under the East and West India Dock Railway, along Albion-road, West-street, and through the Victoria-park, and under Sir George Ducket's Canal, up *to which point it is kept up to such a level that it may be carried over or under the river Lea navigation.*" And, again, "*This sewer is kept at such a level (for the purpose of being carried over or* UNDER *the river Lea,* and discharging at high water by gravitation) that a portion of the drainage of the Hackney marshes cannot be turned into it."*

Now this passage under the river surely involves a syphon? one seemingly as long, from the position which they have chosen, as that objected to. Mr. Roe gives the aqueduct alternative; and the *only* discoverable point of difference between Mr. Roe and Messrs. Bazalgette, Stephenson, and Cubitt, is that the reporters, in their previous reports, give the syphon alternative. In point of fact, it resolves itself into a mere transposition of words, with this distinction, that the reporters are indifferent upon the subject, while Mr. Roe attaches some value to the syphon alternative.

Mr. Stephenson looks upon tunnel sewers, under certain conditions, as syphons. Before the committee he started a most serious objection to their use, one with which, as he himself said, he did not know how to grapple. He thought that when floods gorged them, and overpowered the pumps, the velocity of current in them would be so much reduced as to cause their silting up, because at such times they would become reservoirs.† This argument was upon a tunnel falling 4 feet per mile: his own tunnel, on the north side, falls (for the last 3 miles) at the rate of 1½ foot per mile, with a mean velocity of current, *when fully charged*, of very little more than 1¼ mile (1·65 mile) per hour. He seemed to think that a velocity of 2 miles per hour would be insufficient to prevent this silting up, a velocity nearly one-fourth more than the natural velocity in his own tunnels, with the discharge and lift in equilibrio. In proportion to the gorging of the tunnels by floods creating a disturbance of the balance, so must they assume all the characteristics of a syphon, varied only by the number of inferior orifices through which they pour or syphon their contents, many feet above their own level, into the Thames, either directly by special branches, or mediately, through suitable tributaries.

This syphonic action would take place upon every addition to the assigned ¼-inch rainfall in the twenty-four hours.‡ This may be for thirty-three days or thirty-nine days in the year, as in 1853 and 1852; assuming with the reporters the equal distribution and discharge of the fall within *their* period. But as rains fall *generally* in much shorter times and at greater rates, the view taken of the action of the tunnels is by no means the least favourable one. Of course all tunnels having insufficient power to meet *storm* discharges are open to the same objection; but it should seem that those are least so, or at all events least fatal in their effects, which drain the smallest areas and have the greatest falls.

Whilst upon this subject it may be as well to consider how the designers of the main drainage, in their original reports and in their reviews of Mr. Roe's schemes, provide for the exigencies of storms. Would they always keep up sufficient steam to meet storms, always of uncertain advent, or would they wait for storms? Of course they must have a maximum *establishment* to meet these cases, so that they could save only in the coals, &c. and in the less depreciation of the spare engines.

Messrs. Stephenson and Cubitt say, "The high level (Hackney-brook sewer, as already explained) must act as a *drainage* sewer for 7 square miles, and remove the sewage and a portion of the storm waters from another 7 square miles."§

Mr. Bazalgette, on the contrary, in his report of 1st October, 1853 (approved by Messrs. Stephenson and Cubitt), expressly says, "that it will divert the *whole of the sewage and flood waters of* 14 *square miles* of the upper districts from the low districts, and from the river Thames." Again he says, this time reporting with Mr. Haywood,‖ "The northern high level gravitating sewer, reported upon lately by Mr. Bazalgette, being intended for an intercepting sewer, and at the same time as a main *drainage outfall*, capable of performing *all* the functions of such a sewer for the district through which it passes, *has been calculated to carry off all the sewage as well as all the rains, including storm waters, likely to pass into it from the area drained by it.*" And again on 30th October, 1854, he says, "This sewer *would drain* 14 *square miles altogether*" (p. 18).

Messrs. Stephenson and Cubitt's reports of 1st and 8th October, 1853, will sufficiently show their approval of Mr. Bazalgette's views.

The sewer for the complete drainage of these 14 square miles is shown in the first table (No. 1) appended to Messrs. Bazalgette and Haywoods' report,* to be a 12 feet 6 in. circle, falling (for a length of 1 mile 2,470 feet) at the rate of 1 in 1,359. One inch of rain in the hour on this area (8,013 acres) is equal to 539,236 cubic feet per minute, and this 12 feet 6 in. sewer would discharge 1-16th part of this quantity, or 1-32nd part of that 2-inch rate of fall and yield, forming so prominent a feature in the evidence of the reporters.†

Messrs. Stephenson and Cubitt *now* say, "The lower portion of the sewer designed for this purpose would discharge 47,000 cubit feet per minute, being 12 feet 6 inches diameter, with a fall of 1 in 600."‡ Mr. Stephenson seems to have underrated the discharging power of this sewer. The approved formula gives about 49,000 cubic feet per minute.

It will be noticed that Messrs. Stephenson and Cubitt take the drainage and the whole of the flood waters from an area of only seven square miles; and the sewage, and a portion of the storm waters only, from the other seven mile area; thus reducing the *whole flood area* one-half, or by more than 4,400 acres, and more than doubling the rate of fall: they nevertheless provide the same sized sewer fixed by Mr. Bazalgette, and previously approved by themselves, for taking the *complete* ordinary and *flood* discharge of the whole 14-mile area, or reducing in some, probably large, proportion the flood discharge on one-half their area, they provide through their 12 feet 6 in. sewer, falling 1 in 600, a capacity one-half greater than Mr. Bazalgette had previously provided for the complete flood discharge on the whole area.

The fall in the 1 mile 2,470 feet, would be at $\frac{1}{1359}$ 5·7 feet, at $\frac{1}{600}$ 18·0 feet nearly, so that the mere error in level would be full 7 feet.

In their report there is a curious, but at first sight apparently unimportant, omission, seemingly, when followed up, giving the clue to the design of this great change in the Hackney-brook scheme. When speaking of the functions of this sewer, there is a remarkable abstention from all reference to previous reports or tables. This is evidenced by contrast with the explicit references, in the two following paragraphs of their report, to the tables "in your engineer's report," when speaking of the middle and low level sewers.§

The northern high-level table (No. 1)‖ would have shown the 12 feet 6 inch sewer falling 1 in 1,359, not 1 in 600, as they have it, a fall not to be found in this table, nor in any of the tables, and, as has been shown, a reference to the report would have disclosed the *fundamental* discrepancy.

Probably the following passage in Mr. Roe's Report (p. 7) may assist in the solution of this wide departure from the approved designs: "There was, therefore, no reason for incurring expense by bringing waters from the west side of Maiden-lane into the Hackney-brook line; necessitating the forming a large sewer along this line, and, *after all, one inadequate to its implied purpose.*"

Instances are given of the nice application of the formula which they approve to correct deficiency and excess of size where the *flood-marks* show the errors in their examples.¶ But there is sufficient internal evidence to show that they have suited their formula to *one* part of a hydraulic fact involving two essential conditions, and which part might as well have been collected from a tide-locked sewer as from an active sewer.

Messrs. Stephenson and Cubitt have no doubt of the value of Mr. Roe's table published in one of the general Board of Health's Reports,** showing the dimensions of sewers necessary to drain districts of a given area, "founded, as they believe it to be, upon an extensive series of careful observations," "but" they say, "it is satisfactory to find that it *signally confirms the accuracy of the calculations followed by engineers in considering such questions;*" and they allude to Mr. Hawksley's statement of the "close coincidence between the table formed by Mr. Roe and the formula used by him."

Mr. Jebb, the chairman to the Metropolitan Sewers Commissioners, however, repudiates the table, and consequently "the accuracy of the calculations followed by engineers in considering such questions."††

In his letter to Viscount Palmerston, dated 8th March, 1854, he says,—"Of late, in laying down new sewers, hydraulic science has been rigorously applied, with a view to prevent either a defect or an excess in their size. And here, my Lord, I feel bound to observe that the Commissioners have not accepted the hydraulic tables which are understood to be adopted by the Board of Health; those tables being in a large measure at variance with the results both

* Table 2.

† Report, May 15, 1854, p. 8.

‡ Report, December 11, 1854, pp. 30, 31.

§ Mr. Forster's Report and Plan, Northern Drainage, Jan. 30, 1851.

‖ Mr. Stephenson's associate in the main drainage of London in 1850-1, and former assistant.

¶ Reports and Plans, October 6 and 17, 1853.

** Report, December 11, 1854, pp. 35-6.

* Reports, October 1, 3, 8, 1853, pp. 5, 6.

† Evidence, 3238-9-90-1-2.

‡ Registrar General's Report. On 25th July, 1852, 2 inches (1·99) fell; but of this quantity it is recorded that half an inch fell in one quarter of an hour, being at the rate of 2 inches per hour: and that 1 inch fell in another quarter of an hour, being at the rate of 4 inches per hour. So that in half an hour three-fourths of the whole fall took place.

§ Report, Dec. 11, 1854, p. 42.

‖ Report, Jan. 21, 1854, p. 161.

* January 21, 1854.

† Messrs. Bazalgette and Stephenson's evidence, June, 1853.

‡ Report, December 11, 1854, p. 42.

§ Report, December 11, 1854, p. 42.

‖ Report, January 21, 1854.

¶ Report, December 11, 1854, pp. 39, 40.

** Report, December 11, 1854, p. 39.

†† Return, Metropolitan Drainage, April 11, 1854, pp. 179, 180.

of science and experience, English as well as continental, and being such as, if adopted for London, would entail the most serious consequences to the health and property of its inhabitants, by giving rise to the construction of sewers too small to answer the purposes intended."

Now let us see the result of Messrs. Bazalgette and Haywood's, Stephenson and Cubitt's, reasoning and admissions.

Mr. Roe's table shows a 9-feet sewer falling 1 in 480, conveying the water from 1 inch in the hour rainfall (with house-drainage) from 4,425 acres.

Mr. Bazalgette, on the contrary, asserts that a 9 feet 6 in. sewer falling at the same rate, will discharge only one-tenth of an inch in the hour rainfall (without house-drainage) from only 4,560 acres; for he says that Mr. Roe's 7 feet 6 in. sewer for the drainage of 7·12 square miles, or 4,560 acres, is altogether too small, and that it ought to be more than 9 feet 6 in. in diameter, as his, Mr. Bazalgette's datum of the discharge of 28,728 cubic feet per minute from 2½ inches of rain equally distributed over twenty-four hours, *i.e.* equivalent to about one-tenth of an inch per hour.

Now, Messrs. Stephenson and Cubitt (who follow Mr. Bazalgette in their mode of calculation), assert that Mr. Roe's table signally confirms the accuracy of the calculations usually followed by engineers in considering such questions; but as Mr. Roe's table gives a result so much exceeding their own results, this would seem, on their own showing, to be impossible.

Hence the proof of the coincidence of Mr. Roe's table, and their formula involves the abandonment of their hypothesis of the fall and discharge in equal times.

But the engineers' hypothesis of the co-equal fall and *discharge*, contains an impossible condition; for *discharge* involves action through space and time, or motion, but this is inconsistent with the terms of the hypothesis.

Hence the discharge from any given fall is spread over a period proportioned to, and governed by, a vast variety of conditions, in the extent and character of areas, of discharging channels, of relative absorbencies of strata, of local peculiarities, &c.; and which, *à priori*, cannot be provided for.

Hence one error of the procrustean application of formulæ, howsoever generally correct as representatives of one unvarying condition.

Hence, if Mr. Roe's table and the formula be coincident, Mr. Roe's sewer is adapted to convey a flow not exceeding one-tenth of the inch per hour; and the discharge of his inch fall per hour, *must* be so distributed in *time*, as never to exceed this rate of flow; or it may be stated thus:—supposing an inch in the hour rainfall, and the rain then to cease, and assuming with the engineers it all finds its way into the sewers, then it would take ten hours at least to flow away; for by the engineers' formula, the sewer cannot take more than one-tenth of the fall, or the discharge, terms equivalent to their apprehension.

Hence, by parity of reasoning, standard with standard, it does appear that Messrs. Bazalgette and Haywood, Stephenson and Cubitt's capacities of sewers, for the main drainage of London, *must* be, on their own showing, extremely in excess, and consequently much more costly than the necessities of the case, as they show them, can require.

We want and must have complete drainage, but it is very desirable not to waste the rate-payers' money.*

ON THE SPIRE OF ALL SAINTS' CHURCH, CHESTERFIELD.

INSTITUTE OF BRITISH ARCHITECTS.

AT an Ordinary Meeting of the Institute on the 8th inst. Mr. W. G. Coldwell read a paper on what often excites the curiosity of the traveller—namely, the spire of Chesterfield parish church. Its situation in the Midland Counties, near one of the principal railways, and adjoining that part of Derbyshire which is so much frequented by tourists, renders it much more familiar than many structures of greater architectural worth. Whoever sees it, said the reader, cannot but be struck with its peculiar outline, and curiosity is increased when, on inquiring the cause, one fails to receive a satisfactory answer. A local rhymer says,—

> "Whichever way you turn your eye
> It always seems to be awry,
> Pray can you tell the reason why?
> The only reason known of weight,
> Is that the thing was never straight."

This is one account concerning this spire, that has in the neighbourhood numerous supporters. Many firmly believe it was built crooked, as we now see it. But there is another version far more singular, and which is, I think, more generally entertained,—that is, that the spire is not crooked, but is perfectly upright and perpendicular. When in Chesterfield last summer, in a position about the best for observing the inclination of this spire, I inquired why it was crooked from a gentleman whose age and intelligence I thought would assist me in this investigation. To my surprise, he, in the most positive manner, assured me it was "quite straight." He declined giving a reason why it appeared otherwise, and I could only regret that any one should make such bad use of his eye-sight. Within the last month I have had frequent proofs of the belief, out of Chesterfield, that this spire is straight; and strange to say, I find it even in print, with a reason assigned for its appearing otherwise.

In a work entitled "A Tour through Great Britain," published in 1753, there is the following concerning Chesterfield: "It has a fair church. The spire of its steeple being timber, covered with lead, is warped all awry." This gives us evidence of the existence of this inclination for upwards of 100 years.

Internally, this spire presents the strangest assemblage of timbers that can be conceived. The great deflexion from the perpendicular, amounting to about 7 feet, the twisting round of the upper part, which amounts at the apex to about 60°, the timbers which have been added when it was repaired,—all these combined with the want of light, produce such a constructive Babel, that I much question if its equal can elsewhere be found. On closely examining it, however, we are enabled to discriminate without much difficulty between what is old and what is of more recent date. The original construction is entirely of oak, while deal has been used in the repairs; and again, the old work is mortised together, and fastened with oak pins, and the new is secured with iron bolts and straps. With these particulars and guides, I have made out, from measurements taken in September before last, a section, which shows all the timbers that remain of the original construction. It may be described as follows: upon the tower walls, which are here 3 feet 6 inches in thickness, rest four tie-beams, each being of the scantling of 18 inches by 9: two of these rest on the north and south sides, and the other two are placed in the opposite direction, at right angles to the first, and notched on the top of them. At their intersection are four upright posts, 14 inches by 9 at the base, slightly converging inwards, which form as it were the posts of two queen trusses, and have struts, or principal rafters, 11 inches by 6, on all the eight sides. These posts are tenoned at the bottom into the upper tie-beams, and at the height of about 18 feet are tenoned into the under side of a second set of tie-beams. These second tie-beams, of the scantling of 15 inches by 9 inches, have others crossing them at right angles, notched on the top of them, similar to those first mentioned. Posts, 8 inches by 8, are tenoned into these, and these posts, at the height of about 17 feet, are again tenoned into the underside of a third set of tie-beams, which are of the scantling of 12 inches by 11. The same construction is repeated, and at an additional height of about 16 feet we have the inner upright timbers, or queen posts, tenoned into the under side of a fourth set of tie-beams, 9 inches by 7. From the upper side of these last, the four inner posts, of diminished scantling, rise uninterruptedly as far as the construction can be seen, or to what is called the "crow hole." At the level of each of these tie-beams are struts, or principal rafters; also, between the posts are diagonal beams, all halved and pinned together; and also, a small scantling of timber placed horizontally, tenoned into the four sides of the upright posts. The ends of the tie-beams are secured to angle or hip rafters, which at the base are of the scantling of 8 inches by 6, and diminish to 5 inches by 5 at the top.

The Rev. George Hall, who, during his curacy of this church, wrote a history of it, says—"By measurement in January, 1818, the ball on which the weathercock is fixed was found to lean towards the south 6 feet from the perpendicular of its base, and 4 feet 4 inches out of its perpendicular towards the west, which gives a deflexion nearly south-west of 7 feet 5 inches."

The height of the spire itself, without the tower, is 111 feet: the tower is a square of 23 feet 10 inches inside, and the walls are 3 feet 6 inches thick. He believed the remarkable twist in the spire was caused by the decay of the timbers of one of the series of upright posts, by which the whole superincumbent weight had been brought down.*

THE DISTRICT SURVEYORS AND THE BOARD OF HEALTH.

ON Wednesday, the 24th instant, a deputation of district surveyors under the Metropolitan Buildings Act, introduced by Thomas Alcock, Esq. M.P. and consisting of Professor Donaldson, Mr. Pownall, Mr. Gutch, Mr. Kendall, Mr. Godwin, and Mr. Hesketh, waited upon Sir Benjamin Hall, the president of the Board of Health, with reference to the allegation contained in a letter of the secretary of the Board to Lord Palmerston, already referred to by us, of their having omitted to take sufficiently stringent steps with regard to cellar-dwellings and noxious trades. They pointed out to him the imperfect nature of the data upon which the letter was founded, and the incorrect interpretation given to them. They proceeded to show that the requirements of the Act as to cellar-dwellings, did not give the district surveyors the powers attributed to them, and that there was no evidence of the illegal establishment of new noxious trades and businesses. The continuance of the old ones is permitted by the existing law till 1874. Sir Benjamin admitted that it was in truth a question of judgment, as to the powers really possessed by the district surveyors: he still considered, himself, that they ought to have interfered to prevent the occupation as separate dwellings of underground rooms not in accordance with the Act; but when he brought in his Bill for the better regulation of the metropolis, he would not fail to state the view as to their powers entertained by the district surveyors.

METROPOLITAN BUILDINGS OFFICE.

THE REGISTRAR'S SEAL.

WE have seen a copy of an opinion of Mr. Lush, the barrister, upon the question referred to in our last number, as to whether the confirmation by the official referee of a district surveyor's certificate, in a party-wall case, required the registrar's official seal to give it completeness and validity, or not, and the following passages from that opinion seem clear and decided that it does not:—

Copy of Mr. Lush's Opinion, in the matter of Read.

"I am of opinion that the official referees have done all which is required of them in this case by the 'Metropolis Buildings Act,' that their confirmation of the surveyor's certificate is valid in law. It is not, I think, strictly formal, but there is nothing in it contrary to law."

"I am also of opinion that this is a document which does not require the seal of the registrar. I am unable to divine why some of the acts of the referees should be sealed, and others should not; but it is sufficient that the statute does expressly require the seal as necessary to the validity of some, and it does not require it for this or for several others."

"Although, therefore, I have felt considerable doubt arising from the ambiguous wording of some of the clauses, and the difficulty I have mentioned of distinguishing between one class of documents and another, I have come to the conclusion that the Courts will adhere to the literal requisitions of the Act, and, according to these, Mr. —— [the building owner in the case] is now entitled to proceed, as if the consent of the adjoining owner had been obtained.

Temple. ROBT. LUSH."

It is right we should notice that this opinion is wholly irrespective of that of the Solicitor-General and others given in our last, and was

* In the first article on this subject, at p. 20, second column, for "one-two-hundredth," read "one-twentieth;" and for "maximum," read "minimum." At p. 30, second column, for "6¼ mile area," read "61¼ mile area."

* At this meeting, Mr. B. Ferrey, V.P. in the chair, the following gentlemen were duly elected as honorary and corresponding members:—Mons. Gilbert, architect, member of the Institute, Paris; Mons. Alphonse de Gisors, architect, member of the Institute, Paris; Mons. Armand, Mons. Pellechet, and Mons. Rohault de Fleury, all of Paris, architects.

obtained, not by the referees, but by the party interested in the proceedings. The registrar, who may have felt compelled conscientiously to obstruct proceedings, wherein his views differed from those of the referees, will now doubtless feel exonerated in many cases from that necessity.

CHURCH-BUILDING NEWS.

Memsfield.—The Bishop of Lincoln lately laid the foundation-stone of a new church at Memsfield, Notts. In the cavity of the stone a bottle containing a number of coins was placed. The workmen, on going early, a few days afterwards, to labour, discovered that the smith's shop had been broken open, two crowbars taken, and used in forcing out the stone at the back of the one laid by the bishop and plundering the coin deposit.

Chatham.—The new church of St. Paul, Chatham, has been consecrated. The edifice stands on the north side of the New-road, at Union-street. It has been built from a design by Mr. Gough, architect. Messrs. Dove were the contractors. It is in the Norman style. The total cost has been somewhere about 5,000*l.* of which 500*l.* was for the site. The new church consists of a nave, transept, and chancel, its extreme length being 115 feet, and breadth 25 feet. The transept is 65 feet in length, and 25 feet in breadth. It is built of Kentish rag, faced internally with Caen stone, and externally with Bath stone facings. The circular pulpit and font are of Caen stone, both being decorated with a succession of Norman arches. There is a tower at the south-east end, rising to a height of 100 feet, the dressings of which are of Bath stone. The chancel is paved with encaustic tiles, and the rest of the church with Staffordshire tiling. There are galleries erected over the west end, and over the north and south transepts. The roof is open, and consists of deal, stained to imitate oak, as are also the whole of the pews and pulpit. The pews are low and without doors, and sittings are provided for 1,010 persons, free.

Devizes.—St. Mary's Church here, which has been closed for repairs and restoration during the past six or seven months, was reopened on Monday before last. The alterations effected have been,—the removal of the high, square pews, and the substitution of light and open oak benches; the removal of both galleries, the restoration of the windows, corbels, &c.; a cleansing of the walls and pillars of the interior; and erection of a vestry on north side of chancel. A new pulpit, reading-desk, and communion table have been supplied. Notwithstanding the removal of the galleries, the number of sittings in the church has been considerably increased, through the saving of space effected by the substitution of the present seats for the old pews. The total number of sittings is now upwards of 600, more than one-half, viz. 381, free. An organ has been placed in the opening in the lower part of the tower, over the west entrance. The cost of the alterations has been nearly 1,000*l.* The organ cost 250*l.*

The Lea. — According to the *Gloucester Chronicle*, the parish church of The Lea was reopened for Divine service on Wednesday week. The nave, chancel, and aisle have been almost entirely rebuilt: the tower and spire remain unaltered. The entrance porch has been removed from the south to the north side, an arrangement rendered necessary by the nature of the ground. The removal of a prodigious gallery, which overhung and darkened the church, has improved its appearance; while, by the substitution of open sittings for unsightly pews, much additional accommodation is provided for the poor. The pulpit is of white stone, relieved with a floreated cross. The carvings, with inscription, are the workmanship of Mr. H. Frith, of Gloucester. The whole of the windows appear to have been filled at one time with stained glass. The fragments are preserved, and will eventually be arranged in the east window of the Mortuary Chapel, said to have been the burial-place of the lords of Ecclesweld Castle. There is a deficiency of funds for the repair, of 200*l.* yet to be supplied. A parsonage has just been completed, in the mediæval style. Messrs. Medland and Maberly, of Gloucester, furnished the designs; and the builders employed were Messrs. Wingate and Sons, who executed most of the works.

Beoley.—A memorial window, in two compartments, representing the Virgin and St. John, has been recently placed in the south-eastern aisle of Beoley Church, by Mr. F. Mumford, of Bath. The window was supplied by Hardman, of Birmingham.

Nottingham.—The plans of Mr. Thos. Oliver, jun. have been selected for the new Congregational Chapel, at Nottingham, under the auspices of the English Congregational Chapel Building Society. The works are to be commenced forthwith.

Coventry.—Mr. Ruddle, of Peterborough, we learn, has the contract for reseating the Church of Holy Trinity, Coventry. The unsightly pews and galleries are being removed, and the new seats are to be in this summer. It is calculated, that after providing accommodation for all those who now have seats, there will be 500 free seats for the working classes, uniform as to make with the appropriated seats.

Mansfield.—The foundation-stone of a new church was laid here on Friday week. The edifice, which is dedicated to St. John, will be a rather light structure of the Decorated style of Gothic architecture of the fourteenth century, and will afford sitting accommodation for upwards of 1,000 persons. The extreme length of the building will be 172 feet, and the width 66 feet, and it will consist of a nave and two side aisles. A tower, in height 80 feet, will be placed at the west end, surmounted by a spire of 85 feet in length, access being had to the clock-works and belfry by means of a turreted spiral staircase at south-west angle of tower. The entrances are on the north side of the chancel vestry, through a porch on the south, and beneath the tower on the west side of the building: there is also a priest's entrance on south side of chancel. The walls of the edifice will be composed of Mansfield stone, with Ancaster stone facings. The body of the church will have plain sittings, and merely square bench-ends. The height of the nave, which will be supported by five arches, will be 57 feet, and that of the chancel 48 feet. The heating of the church, which is to be effected by means of hot water, has been placed in the hands of Messrs. Silvester and Co. of London, and the builders are Messrs. Lilley and Elliott, of Measham. The architect is Mr. Stevens, of Derby. The edifice will be finished, it is thought, by June, 1856. The original fund whence this church is being built (6,000*l.*) was provided by the late Mr. Galley Knight, M.P. for Notts. The builders' work has been contracted for at 5,900*l.* to which must be added 1,100*l.* for enclosure and drainage, heating, bell, architect's commission and expenses, and the furniture of the church, making a total cost of 7,000*l.* About 1,000*l.* more are required to complete the erection of the building, and subscriptions are solicited.

Sunderland.—Three stained-glass windows, by Powell and Sons, have been placed in the chancel of the church at North Sunderland, a gift of the Rev. W. N. Darnell.

PROVINCIAL NEWS.

Boston.—An influential public meeting was held here last week for the purpose of establishing a new gas company. It was resolved, by a nearly unanimous majority, "That a company for supplying pure gas at a maximum price of 4s. per thousand feet, to be called 'The Boston and Skirbeck New Gas Company,' be formed on a mutual principle, which shall constitute an identity of interests between the producers and consumers, in which the profits shall be returned to those who create them as consumers in reduction of price, after payment of a dividend not exceeding ten per cent. That the capital shall be 10,000*l.* to be divided into shares of 10*l.* each, with power to increase the capital to 15,000*l.*; and that each person applying for shares shall pay a deposit of 1s. per share." The present company are said to have not kept faith with the gas consumers, having charged 8s. 4d. after they had got fittings put up on the promise of gas for 7s. 6d.; and having charged 1s. 9d. per three months for use of meters, instead of 1s.

Hitchin.—The new national schools here were opened on Thursday in last week. They have been erected at a cost of nearly 4,000*l.* out of which sum the nobility, gentry, and tradesmen of Hitchin (a place of 7,000 inhabitants only) have contributed 2,013*l.* The schools are built of red brick, faced with stone, and are of Early English style. The roofs are high pitched, and open-timbered, with curved principals. The buildings consist of an infants' school, 50 feet by 25 feet; boys' and girls' schools, each of same dimensions—67 feet 6 inches by 20 feet; class-rooms, 21 feet 3 inches by 14 feet; and library, 14 feet square. There are separate entrance-halls to the schools, with water laid on for the use of the children, and all the rooms are warmed with hot air by Hudson's apparatus. For the master, and the mistresses of the girls' school and infants' school, there are detached residences, each of which contains three rooms on the ground-floor and three bedrooms above. Round the buildings there is a string-course in white brick, upon which various texts of Scripture appear. The schools face the south porch of the old church of Hitchin. The architect was Mr. J. H. Hakewill; and the contractors were Messrs. Butterfield, of Hitchin.

Margate.—The contractor, Mr. Bastow, is now pushing on the works of the new high-water landing-pier. There remain five columns to drive and a few girders to raise.

Chard.—Complaint is made that a clear stream which runs down each side of the Forestreet here is being withdrawn, so as to prevent the washing away of sewage by means of which the locality was benefited. Sickness has been simultaneously prevailing, possibly from this cause.

Milford.—The foundation-stone of a campanile to Castle-hall, the mansion attached to the Milford estate, was laid on Monday week. The architect is Mr. W. H. Lindsay, of London. The tower, or campanile, with tetrastyle portico, Ionic porch, and other intended additions, have been designed in the Italian style of architecture prevalent in the fifteenth and sixteenth centuries. The campanile, from base to summit, will be 93 feet in height; comprising an observatory, a clock tower, and a landmark. The apartments between the observatory and ground-floor are to hold the mathematical and astronomical instruments, &c. The works of the clock (which is to wear four faces) will be contained in the attic part of the building. The various floors will be approachable by a geometrical or circular cast-iron staircase of ninety-eight steps. The niches on the four sides will be occupied by four statues, emblematical of the four winds—draped and posed, to notify the climates and the costumes whence they blow.

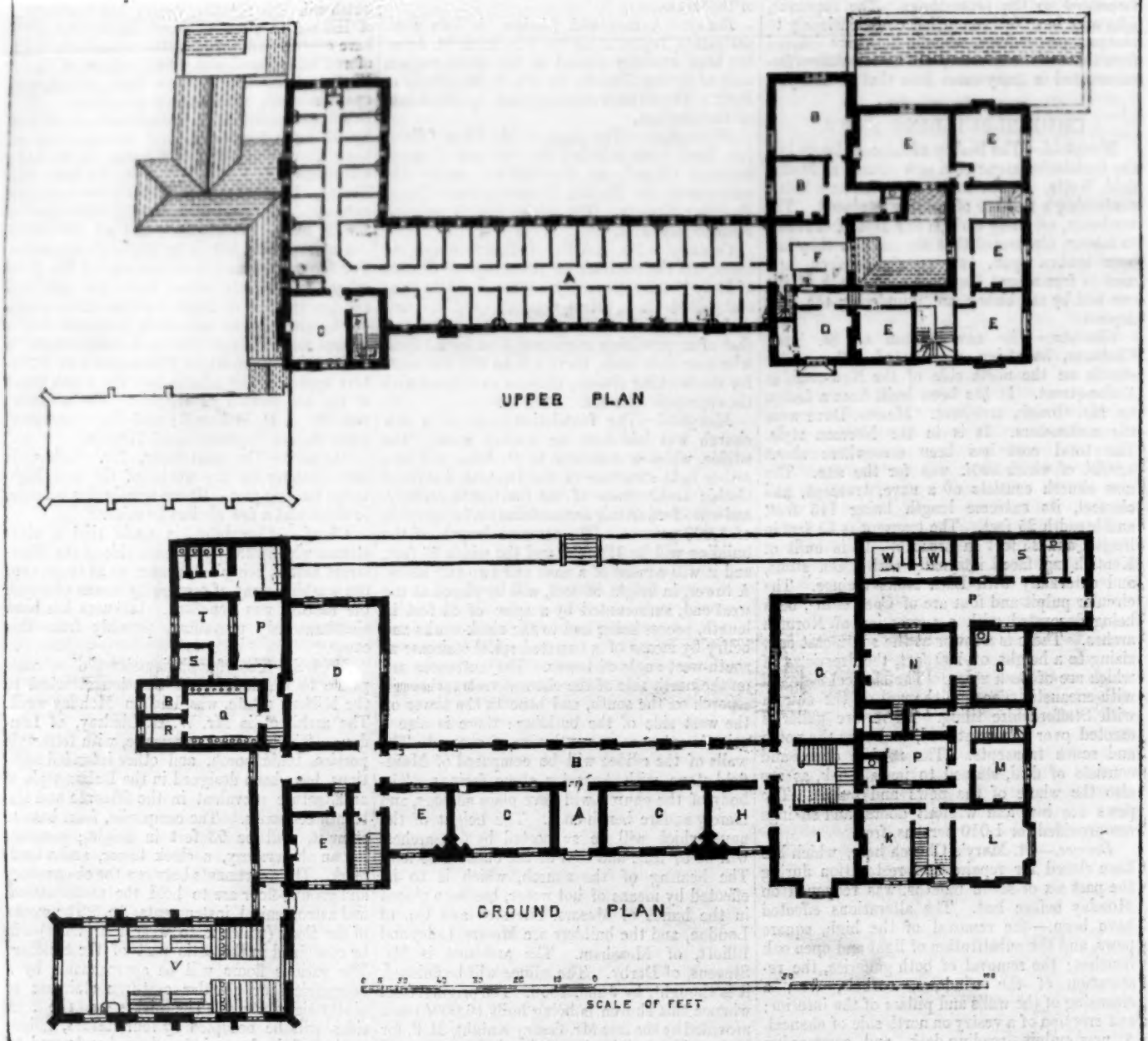
Seaham Harbour.—The Londonderry Literary Institute, Seaham Harbour, was formally opened on the 3rd inst. by Sir Archibald Alison, Bart. the historian. It is in the Doric style, and has a portico of four columns, with side wings, which form the library and news-room. The main body of the structure is appropriated to the purpose of a public hall, or lecture-room, capable of holding about 500 persons. It is built of stone, and cost about 1,500*l.* Mr. Oliver, jun. was the architect.

Chester-le-Street.—The Board of Guardians of the Chester-le-Street Union, having purchased a site, opposite Lumley Castle, for the erection of a new workhouse, have appointed Mr. M. Thomson, of Newcastle, as their architect.

Halifax.—It is said that a new gas company will probably be soon formed here, as the wants and the wishes of the inhabitants have not of late either been attended to or cared for by the present company.

Grimsby.—Messrs. Sissons, of Hull, have contracted for the completion of the fishing-dock here. The works were undertaken by the dock company; but for some time past, and after a considerable amount of expenditure, they have been suspended.

BATH SOCIETY FOR PROMOTION OF THE FINE ARTS.—The Bath Graphic Society has merged into this new association, the first of whose conversazioni was held last week, when a large assemblage of pictures, &c. was exhibited, and the committee have been congratulated by the local press on the signal success of their exertions.



PLANS OF THE EXETER DIOCESAN TRAINING COLLEGE.

MR. WATSON'S RAILWAY TRAVERSER.

A PATENT has been recently granted to Mr. T. S. Watson, B.A. for an improved mechanical arrangement for transferring railway carriages across a railway from one line of rails to another. Mr. Watson says, "I do not claim the principle of transferring the carriages across the lines by placing them on pairs of detached rails, but I do claim as my invention the principle of transferring the carriages across the lines of railway by placing them upon pairs of detached rails, where such rails are supported upon chairs which run on wheels, and which chairs are attached to endless chains, whereby they are moved in such a manner as to pass with them in either direction continuously across the railway."

The advantages proposed by the use of the "improved railway traverser" are, that, as compared with other traversers, it is always ready to receive and transfer a carriage in either direction, not requiring, after shifting one, to be brought back again for the next,—that it moves at one time as many carriages, less one, as there are lines of rail,—that it is worked with much less labour,—and, as the whole of it always either forms a part of the line of rails, or is out of the way beneath them, it does not encumber any part of the line when not in use.

As compared with turn-tables, it saves the time occupied in turning the carriage with the table before and after crossing the line; it avoids the shock which the carriage receives when the turn-table is suddenly stopped by the catches; it saves the labour incurred in turning the carriage and pushing it across the lines,—as its transfer is accomplished by one man at the winch-handle, leaving the other men free to bring up another carriage; and it removes the necessity for the clumsy and dangerous openings at the edge of the platform for the turn-tables to work in, which have been the cause of numerous accidents.

It appears to merit examination on the part of those who are concerned in the construction of railways.

EXETER DIOCESAN TRAINING COLLEGE.

THE premises occupied for some years by this college being found quite inadequate to its wants, it was resolved to raise, by subscription, a fund for the erection of new buildings, to accommodate forty students. The subscription list was headed by the Bishop, who contributed 500*l.* and a sufficient sum having been raised, which, together with grants made by the Committee of Council on Education, and the National Society, would justify the committee in commencing proceedings, three acres of land, a little more than a quarter of a mile from the cathedral, were purchased, and a contract made for the erection of the buildings, exclusive of the chapel. The foundation stone was laid by Sir John Kennaway, Bart. on the 19th of May, 1853, and the new buildings were opened by the Bishop on the 18th of October in the past year. The cost of the buildings, exclusive of the site, has been about 7,000*l.*

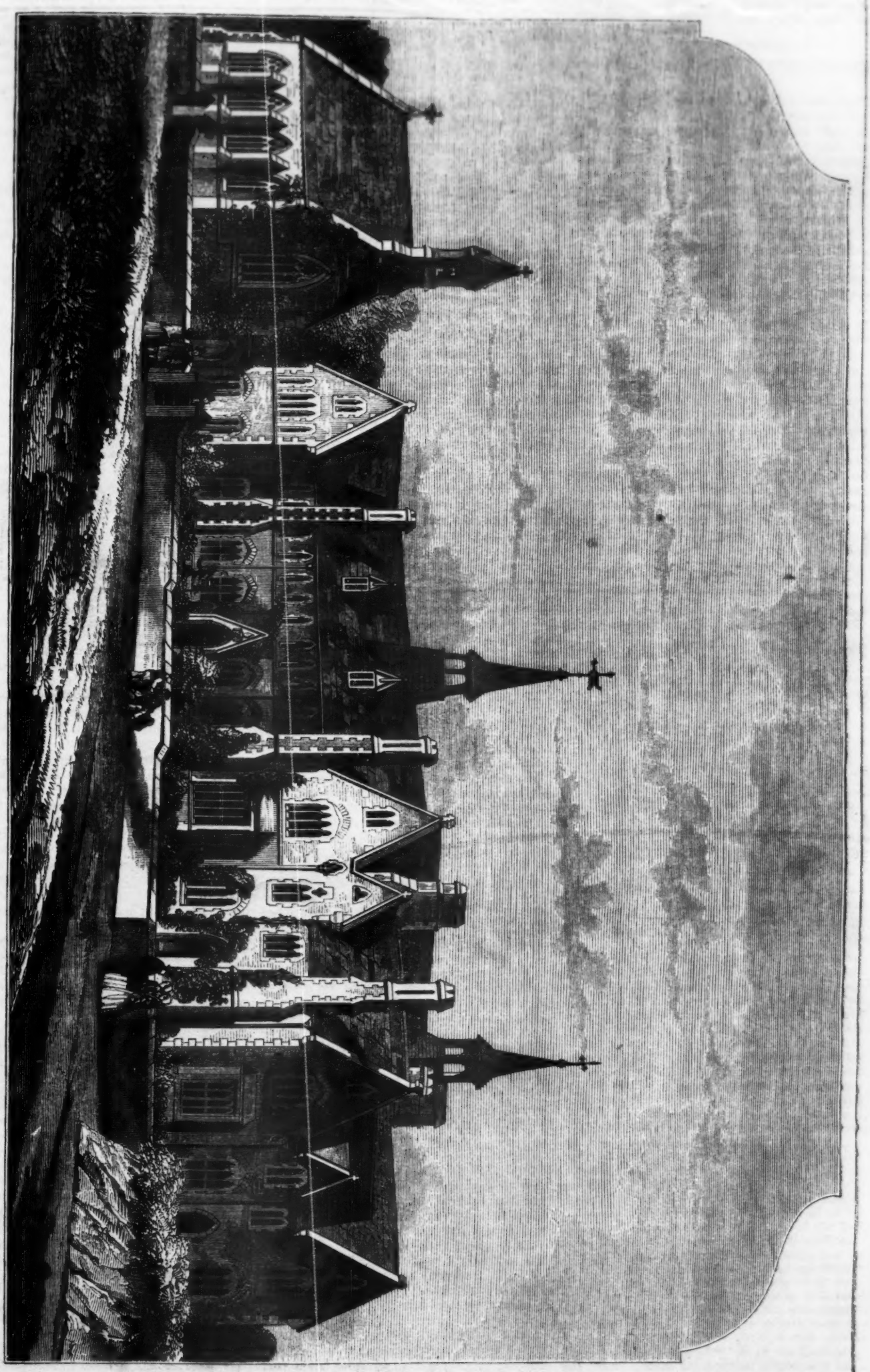
Subscriptions have since been entered into for purchasing two more acres of land, in order to promote industrial training, and likewise for the erection of the chapel, which, although shown in the view, is not yet erected.

Mr. Hayward, of Exeter, was the architect; Mr. Ware, the contractor.

REFERENCES.

Upper Plan.
A. Dormitory.
BB. Sick Room.
C. Vice-Principal's Bed-room.
D. Principal's Bed-room.
EEE. Bed-rooms.
F. Staircase.

Ground Plan.
A. Entrance.
B. Cloisters.
CC. Class-rooms.
D. Lecture-room.
E. Cloaks and Hats
F. Vice-Principal's Sitting-room.
G. Dining-hall.
H. Secretary's Room.
I. Committee-room.
K. Principal's Study.
L. Principal's Sitting-room.
M. Housekeeper's Room.
N. Kitchen.
O. Scullery.
PPP. Courts.
Q. Lavatory.
RR. Baths.
SS. Coats.
T. Cleaning-room.
V. Chapel.
WW. Larder.



EXETER DIOCESAN TRAINING COLLEGE.—Mr. Hayward, Architect.

PHOTOGRAPHIC EXHIBITION.

The exhibition opened by the Photographic Society, at 5, Pall Mall East, should be visited by all who are interested in this wonderful art. Mr. Roger Fenton's landscapes stand pre-eminent amongst the specimens here gathered together. Nothing has been seen more beautiful than his Pool below the Strid, 626, Rivaulx and Tintern.

Mr. Hennah, of Brighton, still maintains his ascendancy, as it seems to us, in the production of small portraits. (49) "The Entrance Gateway, St. John's College, Cambridge," by Rev. Mr. Kingsley; (56) some views in Lincoln, by Mr. Sedgfield; some of M. Laroche's large portraits; (177 and 196) touched portraits by Mr. Mayall; "Clouds," by Mr. Sherlock (248); Mr. Robertson's views about Constantinople; (429) "The Keep of Richmond Castle," by Mr. Cundall; (630) "The Park Side," by Mr. White; and (633) "St. Anne's Well, Great Malvern," by Mr. Joseph Wilks (for the sake, too, of a personal recollection), have special marks against them in our catalogue.

An R.A. said, at the private view, he declined to call this the "*foe*-to-graphic art." The joke is not a new one (ask the witty author of "The Templar" if it be), but we quite agree in the objection.

THE ABUSE OF WORKS OF LIVING ARCHITECTS.

With regard to the criticism of works by living architects, to which your correspondent "M. A." again refers (p. 10), may I be permitted to ask in reply, if a bad building is not as legitimate a subject of condemnation as a bad picture? One hears no outcry against the latter: yet the injury done in the case of the bad building is far greater than in that of the bad picture: it is indeed irreparable as far as it goes! We can escape from the latter, but are haunted continually by the former whenever we are so unfortunate as to be in its neighbourhood. As, therefore, there is so much more at stake in the case of the bad building, it is but fair, for what we pay so dearly, that we should be allowed to avail ourselves of the only consolation remaining to us, viz. the permission to make free use of it as a conspicuous beacon always at hand for future architects to steer clear of,—for our critics constantly to point to,—and for the public at their leisure to examine for themselves. If we are denied this privilege, I do not see how we are to improve! Hence, I think a promulgator of incontrovertible principles will have, or ought at all events to *find*, "occasion to go on" a step farther than your correspondent seems to consider desirable, and if not to "settle for" the public, at least to point out to them, by way of illustration, how these principles can be best applied, or contrasted with opposite principles carried out in individual buildings,—not, as "M. A." says, with a view of "ministering to the indolence of those who like to have their thinking done for them, and enable them to say such a building is bad because Mr. So-and-so abused it," but just the reverse of this, viz. to bring wrong principles more clearly before their eyes than is possible in any other way,—to rouse indolence to use its own eyes, and to think for itself; for the usual and best method of instruction is acknowledged to be by illustration. Now, the position of your correspondent cannot, I think, be maintained, when he says, "Where incontrovertible principles are clearly put forth, hearers will be perfectly competent to decide for themselves on the merits of the buildings that are rising around them,"—without the need of detailed reference to individual examples. This is surely going rather too fast, and assuming a power of judgment, and a knowledge of the principles of architecture in the public mind, which I fancy few will give it the credit of possessing at present. I cannot see clearly the connexion between the two last sentences of "M. A.'s" remarks, but they appear to me to amount to this: "If the language of abuse be unnecessary (which I suppose no one ever doubted), it is natural to expect a liberal-minded critic will allow private feeling more or less to cloak the expression of his real sentiments, and induce him to say partly what he does not think!" But this again is scarcely consistent with his previous admission of my position, that "personal considerations should *not* be allowed to interfere with criticisms that have for their object the discovery of truth." After all, "honesty" is, in the long run, "the best policy," and "truth is not private property," as some one has well said. Now, although no doubt we should be careful always to avoid giving needless offence, may it not be said that very many are far too ready to *take* it, from a principle of love to themselves rather than of love for truth for truth's own sake? Upon the whole, I think it will be found there is especial danger, in the present day, of our damaging, by our courtesies and compliments (which, after all, are often nothing more than so many baits to serve self-interest) that which is of far more consequence than our own individual reputation and prospects, viz. the cause of universal truth, and the prospects and interests of society.

R. W.

PRESERVATION OF TIMBER.

Mr. A. E. Paschal le Gros, of Paris, and Castle-street, London, has patented improvements in preserving timber. The complete specification recently filed at the Patent Office, thus describes the invention:—The improvements consist in a new mode of effectually preserving timber and all kinds of wood by means of a cheap chemical compound, which does not destroy the fibrous structure of wood, or otherwise injure it. For this purpose there is employed a solution of muriate or hydrochlorate of manganese, resulting from the manufacture of chlorides of lime and of the bleaching liquid called lye, or water of gavelle, or chloride of potash, which residue is at present treated by manufacturers as waste. This salt containing a great proportion of acid, it is neutralized by the admixture of chalk (carbonate of lime) or of oxide of aluminum. The salt when thus reduced to a neutral state, gauges by the aërometer, used for concentrated acids, from 30 degrees to 35 degrees, and may, therefore, be easily carried to the place where it is to be applied as a solution, containing three parts weight water to one of acid. The acid in the residue may also be neutralised, and the ferruginous matter in it precipitated by means of oxide of zinc. There is thus obtained a double salt of manganese and of zinc, which is said to have the same or superior preserving qualities, as the double salt of manganese and of lime produced, as above described. This double salt of manganese and of zinc may be very efficiently applied to absorbing the effluvium of putrid or putrescent matter. For preserving wood the solution obtained in either of the two ways described is poured into a trough, and the immersion of the logs, or pieces of wood, is effected by placing them vertically in the trough, in such manner that they are steeped in the liquid to about three quarters of their length. The wood is thus subjected to the action of the solution, during a length of time varying from twelve to forty-eight hours. The solution rises in the fibres of the wood, and impregnates them by the capillary force alone, without requiring any mechanical action, whilst a horizontal immersion under the same circumstances has been found to produce no satisfactory effect. The timber which has been thus prepared, is said to acquire new properties,—to become incombustible: neither has change of temperature any influence upon it. It is hardened, and the preservation is more lasting than that effected by metallic sulphates, which weaken the ligneous fibre, and impart to wood brittleness, and a tendency to crack and warp under the action of heat. The patentee further remarks, that it will be easy, and in some cases convenient, to combine the good effects of creosote with those of either of the two solutions obtained as above described. For this purpose he dissolves in concentrated sulphuric acid a variable quantity of some tarry or resinous oil; then dilutes this solution with water, and mixes a suitable quantity of it with the solution of muriate of manganese when required. The claim of the patent is for "preserving all kinds of wood or timber, or organic matter by means of a double salt of manganese and of lime, or of a double salt of manganese and of zinc, used both (*sic*), either alone or with an admixture of creosote, and obtained in the manner described above."

RAILWAY PROGRESS IN THE UNITED STATES.

This is a subject on which a few memoranda we have gleaned, may not be uninteresting. The extraordinary progress of the United States in railway construction, strikes every one interested in the current history of passing events; and the success of that country in this element of national greatness, is at once an index of the energy and intelligence of the people and a matter of admiration to others. It was in 1825, as will be remembered, that Stephenson superseded the old tramway of the Stockton and Darlington line, upon which a year later he ran the first locomotive. On the other side of the Atlantic, the Trainoy Railway, in Massachusetts, was opened in 1827. It was only three miles in length, and was used only for the transit of granite from the ledges to tide-water. In 1829 there were constructed some twenty-five miles of railway in Pennsylvania for coal purposes. On December 28, 1829, thirteen miles of the Baltimore and Ohio Railway in Maryland, were opened. In 1831, there were six miles of railway in South Carolina. In 1832, seventeen miles of the Mohawk and Hudson Railway were opened. In 1832, Kentucky had six miles of railway constructed. In 1835, Virginia had twelve miles; New Jersey thirty-four miles; Delaware sixteen miles; Alabama forty-six miles; and Louisiana forty miles. The total number of miles of railway finished in the United States, in 1832, was one hundred and thirty-one; in 1833, five hundred and seventy-six miles. The following table, which reaches to 1852, will give an idea of the progress from year to year, from the earliest period mentioned above, throughout the United States:—

Year 1828...	3	Miles	Year 1841...	2,167	Miles
„ 1829...	28	„	„ 1842...	3,319	„
„ 1830...	41	„	„ 1843...	3,877	„
„ 1831...	54	„	„ 1844...	4,174	„
„ 1832...	131	„	„ 1845...	4,311	„
„ 1833...	576	„	„ 1846...	4,511	„
„ 1834...	762	„	„ 1847...	4,870	„
„ 1835...	918	„	„ 1848...	5,336	„
„ 1836..	1,102	„	„ 1849...	6,350	„
„ 1837...	1,421	„	„ 1850...	7,355	„
„ 1838...	1,843	„	„ 1851...	9,090	„
„ 1839...		„	„ 1852...	11,565	„
„ 1840...	1,920	„			

THE AQUEDUCT OF ROQUE-FAVOUR.

INSTITUTION OF CIVIL ENGINEERS.

On the 16th inst. the paper read was "A Sketch of the Canal of Marseilles, and a Description of the Aqueduct of Roque-favour," by Mr. Rennie. This canal was designed chiefly for the purposes of irrigation, but it was extended for supplying the city with water, by gravitation, for domestic use and public distribution, as also for affording water power to numerous mills and manufactories. The water was described as being taken from the River Durance, at Pertuis, a distance of only twenty-eight miles, in a straight line, from Marseilles, but from the mountainous nature of the country, the course was prolonged to nearly sixty miles; passing through forty-five tunnels, and over numerous aqueducts, the largest of which was that of Roque-favour. The source of the canal being 614 feet above the sea, there was a fall of 29 inches per mile in the canal, yet still preserving a height at Les Baumes St. Antoine, near Marseilles, of 490 feet above the sea. The section and the velocity were such as to permit the passage of one million and a quarter tons of water per day, or 198,000 gallons per minute. From St. Antoine four branch canals diverged in different directions for the purposes of irrigation, whilst the main trunk continued on to Marseilles, where it arrived at a height of 242 feet above the sea. The water was at times much discoloured by earthy matter held in suspension, and so much carbonate of lime was deposited, that any attempt to convey the unfiltered water in pipes would probably have ended in their being stopped up by incrustation. This, it was presumed, had in some degree influenced the construction of so great a work of masonry as the aqueduct of Roque-favour, which spanned a deep ravine,—the bed of the River Arc. The structure, which was described as the most important of modern times, and even exceeding in height the celebrated Roman work, Le Pont du Gard, con-

sists of three tiers of semi-circular arches of cut stone, with rustic facing and drawn joints: the lower tier is composed of thirteen arches, 112 feet high and 49½ feet span; the second tier of sixteen arches, 114½ feet high and 52½ feet span; and the third tier of fifty-one arches, 41½ feet high and 16½ feet span; the piers of the first and second tiers being over each other, and the dimensions diminishing upwards. The greatest height is 265¾ feet; the mean height 174 feet, and the extreme length 1,289½ feet. The transverse thickness of the base of the lower piers is 16 feet, and the breadth on the face 18 feet, with projecting and battering counterforts, rising up to the top of the second pier; the transverse width of the upper piers being 14¾ feet, without any counterforts. It contains about 51,000 cubic yards of masonry, and the pressure upon the foot of the tallest pier is equal to 210 pounds per square inch.

The channel for the water is lined with brick and cement, and exhibits some cracks, apparently arising from the subsidence of the second tier of arches.

This work, which was not commenced under favourable auspices, the excavations having been washed away, after the foundations had been partially laid, occupied about six years in construction. It was designed by and executed under the direction of Mons. Montricher, at a cost of about 151,000*l.*: the expenditure for the canal was nearly 700,000*l.*; but the outlay for the whole of this great undertaking was expected to reach nearly 2,000,000*l.* A complete establishment of service reservoirs and filtering beds is being created at Marseilles, with the intention of distributing the water by pipes throughout the city, and, when completed, it might be anticipated, the writer thought, that it would form one of the most powerful and perfect waterworks in the world.

Notices of Books.

VARIORUM.

THE new number of the *Quarterly* contains an article on "Fires and Fire Assurance," and a second on the "Open Fire-place," with especial reference to Dr. Arnott's improvement on Cutler's stove. In the first, reference is made to the danger attendant on the erection of large warehouses, and the restrictive clause in the Metropolitan Buildings Act, that "no warehouse shall exceed 200,000 cubic feet in contents." "The Manchester-warehousemen nevertheless have managed to set that part of the Act at defiance. Let us take, as the latest and most flagrant example, Cook's warehouses. This structure, which within these last two years has raised its enormous bulk in St. Paul's-churchyard, and actually dwarfed the metropolitan cathedral by the propinquity of its mass, contains 1,100,000 cubic feet of space open from end to end, or 900,000 *feet more than it is entitled to possess.* If we were to take twenty-five ordinary-sized dwelling-houses and pull down their party-walls, we should have just the state of things which is here presented to us. But it will be asked, if it is against the law, why do not the proper officers interfere? Where are the City surveyors? The reason, good reader, is this: the Manchester-warehousemen of late years have adopted a new reading of the law—a reading which we believe no judge would allow, but which the surveyors have not yet ventured to dispute. 'We escape altogether,' say these gentlemen, 'the provisions of the Building Act relative to warehouses, as, by reason of our breaking bulk, our places of business are not mere storehouses.' That this reading is a violation of the spirit of the statute there can be no doubt: that it is also a violation of its letter we also believe: if not, it is high time that the law be amended upon this point, for we affirm, on the very best authority, that London has never, since the great fire, been in such danger of an overwhelming conflagration as it is now by the presence and rapid spreading of these huge warehouses, filled with the elements of destruction, and placed side by side, as though for the very purpose of producing the utmost mischief by contagion."——The Kilkenny Archæological Society have issued their volume of Transactions for the year 1854. It includes an elaborate article on the Ecclesiastical Antiquities of Youghal, by the Rev. Samuel Hayman; and an interesting communication from Mr. John Windele, on the Runic Crosses of the Isle of Man.——The third part of the *Journal of the Architectural and Archæological Society of Chester* contains much interesting and valuable matter on local antiquities. The illustrations are still coarse and inexact, but as the funds at command probably would not permit more expensive engravings, it is better to have even such records as these rather than none.——"The Art of Travel; or, Shifts and Contrivances available in Wild Countries," by F. Galton, is a volume full of experience and suggestion, yet capable, as the author himself points out, of being made still more replete with valuable matter, gleaned from the experience of other civilized "bush-rangers." Mr. Murray is the publisher.——"The Chemistry of Common Life," by Mr. J. F. W. Johnston, a series of admirable little treatises which appeared in separate sheets, has been collected into two goodly volumes, the second of which is now before us. The publishers are Messrs. Blackwood.——"The Edinburgh New Philosophical Journal," published by Messrs. Longman and Co. has entered on a "new series," and from its celebrity and its *old* and established standing, ought now, in place of being called a new journal, or rather, a new new one, to be simply named "The Edinburgh Philosophical Journal." It has acquired, however, a sort of new life by being placed in the editorial hands of three gentlemen of well-known ability, Prof. Anderson of Glasgow (Regius Professor of Chemistry,) Sir William Jardine, Bart. and Dr. Balfour, Professor of Medicine and Botany, at Edinburgh. Its former able editor, Dr. Jameson, if we mistake not, died some short time since. The quarterly part for January current, has just been issued. The opening article, amongst its varied contents, is one on the means of realizing the advantages of the air engine, by Mr. W. I. M. Rankine, C.E.——A small volume on "Indestructibility," published by Messrs. Groombridge, teaches that "one of the great truths proclaimed by nature and science, and traced throughout surrounding things, from a bit of coal up to the soul of man," is the indestructibility of all things, or rather of all "matter." There is much truth, but some fallacy in such teaching, and what is more, it is capable of being reversed, and the very contrary conclusions deduced from it. Carbon, a favourite exemplar with the author, is regarded as one of the elements of nature, and as such essentially indestructible; and it may be so, but it was Davy's opinion that probably *the only* substance in nature entitled to be truly regarded as an element, was hydrogen. All other "matter," therefore, he inclined to believe, was based on or derived from hydrogen, and hence might be resolvable into it again, so that such matter as carbon, for instance, may yet be found to be destructible into other proximate "elements;" so much so, that carbon would then no longer exist. To rank the soul of man, therefore, with carbon, as only equally indestructible, is to trench on ground which the author himself ought to regard as somewhat dangerous. Just as potash was not long ago regarded as an indestructible element one day, and the next was decomposed and destroyed into a totally new metal and oxygen gas, so that the potash so decomposed and destroyed no longer existed, carbon also may, to-morrow, be destroyed into some other new metal and hydrogen; or, it *may* be something else. We do not suppose that the author meant to insinuate that the soul of man can ever be converted by decomposition into something else—into two or more other "things" or principles, whatever they might be; but assuredly his doctrine implies as much. It is easy to talk about the indestructibility of "matter" which *is not* "all things;" but which is the name we give to *that* of which all things are supposed to be "made," although the probably more orthodox doctrine is that "all things" were made of "nothing." In truth, while we talk about "matter," we know nothing in the world about it. Many matter-of-fact philosophers do not believe in its existence at all. Even Professor Faraday seems inclined to think that "all things" are based and built up, as it were, on active energies, forces, or powers, existent in physical points, and that there is no such thing as the "matter" whose *essential* properties, on the contrary, are *passivity* and *inertia*.

Miscellanea.

WAR APPLIANCES.—One of the important floating fortress-batteries, in preparation at Cherbourg, is described in the *Courier du Havre*. It is called the *Devastation*. As no attempt has been made to gain beauty at the expense of solidity, in appearance it is very like the huge barges which ply on the Seine between Havre and Rouen. It is entirely flat-bottomed, so as to draw but little water, even after receiving heavy artillery. It is 51 yards long and 14 yards wide, and will be armed with sixteen guns of fifty. Its sides are nearly 13 inches, with sheets of iron nearly 4 inches thick besides, and capable of withstanding the most furious fire of 64 lb. shot at even 10 yards distance. The ribs are from 13¾ to 15¾ inches thick, and are placed close together. The battery will be covered over, and will be supplied with a screw of 150-horse power. Its powers of destruction will be very formidable. The *Devastation* will, it is expected, be completed by the end of February. It ought, if still needed at Sebastopol, to be forthwith dispatched to the Black Sea instead of to its original destination, the Baltic: at least some of these batteries surely will be sent south as well as some north. The idea appears to be not very novel after all, although no such battery has ever yet been finished. Ever since 1842 there has been one on the way at New York, for the protection of its harbour. The dimensions of this one, however, are really unwieldy: it is 400 feet in length. The frame has been for some time complete, and the heavy iron plates about one-third fixed; but lately 140 men who had been at work on this leviathan were temporarily discharged on account of some straitness in the money market.——Mr. Liddell, the engineer of the new Leicester and Hitchin Railway in connection with the Midland, and who superintended the laying of previous submarine cables, has been sent by Government to Turkey to superintend the laying of the cable between Varna and Balaklava or Cape Chersonese. The length of this cable, by the way, as well as the distance, is variously described. There is said, however, to be 400 miles of cable, and it is to be presumed that full allowance for slack in laying has been made. The telegraph is said to be the self-registering one of Morse, with a French improvement whereby several messages can be dispatched from either end, through a single wire, at one and the same time.

THE BURIAL-BOARD AT ABERGAVENNY have decided on adopting the designs of Mr. Henry Ramur for their new cemetery. The chapels for the same were let on Thursday last to Messrs. J. and W. Price, masons, of Abergavenny, who are now engaged on the drainage, boundary-walls, &c.

THE SURREY ARCHÆOLOGICAL SOCIETY.—The council have made a report upon the termination of the first year of the society's existence, from which it appears that the progress has been satisfactory. One of the proposed objects of the society was the establishment of a library and museum; and it is satisfactory to state, that some progress has been made in this respect. Already upwards of fifty volumes have been contributed, with various manuscripts, drawings, pamphlets, and printed papers. A collection of nearly 500 topographical and other prints, relating to the county, has been formed. A number of rubbings from Surrey and other brasses have been obtained, also a series of eighty corporate abbatial and other seals, including those of the Earls of Surrey. On the 1st January, 1854, the total number of subscribing members was 300, while on the 1st January, 1855, it was 391, of whom 47 are life members.

THE EGINA MARBLES AT SYDENHAM.—Allow me to make a suggestion to the directors with reference to the casts of the magnificent group of statues, discovered, by Professor Cockerell, to belong to the western pediment of the Temple of Minerva, at Egina. Placed as they are at the end of the nave, and within a few feet of the glass windows, much of their intrinsic merit is lost to the beholder, from the want of a good background. The effect of the glass, peering as it does with undue intensity through the group, is positively painful. Why not erect a model of the tympanum and cornice, as is done at the British Museum, coating the former with red plaster, after the manner of the original temple? I can myself bear evidence that such material and colour were used, and I doubt not there are many others who have also visited the temple, that can bear additional testimony to the fact. No one who has seen the original figures in the "Glypthotek," at Munich, and admired them as I have done, would believe that those in the Crystal Palace were correct copies, so much are they spoiled by a bad position. If my suggestion of a restoration of the pediment be objected to, on the score of presenting the inspection of the statues from behind, then the next best remedy would be to erect a red screen some three or four feet off. At all events let the glass lights be hidden, and the group resuscitated.

W. G.

THE STANLEY MEMORIAL WINDOW, NORWICH.—With reference to Mr. Harrod's criticism of the Norfolk Memorial Window, recently reported by us as part of the proceedings of the Norfolk and Norwich Archæological Society, a correspondent writes as follows:—"Mr. Harrod impugns a statement, which lately appeared in the Norwich papers, 'that a design of this kind is justified archæologically by the architecture of the window,' asserting, 'without fear of contradiction,' that 'no specimen of glass, at all resembling that now in the window, can be produced of an earlier date than 1500,' the date of the window itself being 1450. But I am unable to see the force of Mr. Harrod's remark. No one ever meant to assert that the style of the ornament was not as late as 1500, or even later; but only that the principle of carrying the design across the window, irrespective of the mullions, was justified archæologically by the architecture of the window, which is indisputable, the principle having been introduced long before 1450, dating, indeed, with the introduction of the mullioned window in the thirteenth century. Again, Mr. Harrod asserts, that in old glass the size of the human figure was never permitted to exceed that of an ordinary man, a statement utterly at variance with the fact. Mr. Harrod next declares, that the subjects chosen are a complete jumble, 'the window beginning with the Nativity, and ending with the Presentation of the Law by Moses;' and informs us that whether an old window 'had five pictures or fifty, they all had some relation to each other.' I believe it would sorely try the ingenuity of Mr. Harrod or any one else, to show the relative connection between the subjects in some old windows I could name; but passing this by, I cannot accede to Mr. Harrod's reading of the subjects in heraldic order, or to the notion that no Scriptural allusion is tolerable which is not directly taken from some Mediæval precedent. I do not presume to enter into an argument on the artistic part of the question, and will content myself with the remark that such of Mr. Harrod's objections on this score as are at all tangible, were anticipated and overruled by the committee, after much time spent in deliberation and personal examination of several old as well as modern windows of various designs. I, therefore, venture to express a belief that the citizens of Norwich, notwithstanding a criticism so oracularly enunciated, may remain satisfied with their window; which many judges, quite as competent as Mr. Harrod, have pronounced to be by far the best hitherto produced in England, and one which vindicates the claim of glass painting to be ranked amongst the fine arts."

JORDAN'S PATENT CARVING-MACHINES.—It may be useful to call the attention of our readers to an advertisement in this paper, announcing the sale, on the 29th instant, of the stock in trade and plant of Jordan's machine-carving works in the Belvidere-road. In the hands of an individual of business habits and acquainted with the trade, such a mode of cheapening the production of carved work of various kinds ought to succeed, the field embraced by the operations of the machine being numerous. To a person wanting premises and a business of this kind, or as an auxiliary to builders, ship-builders, manufacturing upholsterers, sail-block makers, &c. this sale affords an opportunity which seldom occurs.

ARCHITECT TO THE COMPANY OF DRAPERS.—An active canvas has been going on for some time past for the appointment of architect and surveyor to the Worshipful Company of Drapers of the City of London, rendered vacant by the retirement of Mr. W. J. Booth. At the last meeting of the court, held on the 4th instant, Mr. Herbert Williams was elected to the office. We hear that about twenty architects put themselves in nomination, out of which number rather more than half delivered in their testimonials, and proceeded to the poll.

SANITARY MEASURES.—Sir Benjamin Hall has brought in two Bills to the House of Commons, one to alter and amend the Public Health Act, and the other to alter and amend the Nuisances Removal Act. Sir Benjamin stated, that should these Bills pass the second reading, he should then move that they be referred to a select committee, in order that they might both be considered fully in detail by gentlemen practically acquainted with the operation of the law, from whom valuable suggestions might be expected. It is of the utmost importance that this should be the case.

THE OPERA-HOUSE AT BRUSSELS has been destroyed by fire, including all the decorations and costumes. The correspondent of the *Morning Advertiser* says, "The theatre was built in 1817, from designs of the architect, Dumesme, and recently rebuilt at great expense. Indeed, the new theatre was considered one of the richest and most tasteful in Europe. The *bas-relief*, by the Belgian sculptor, Simonis, adorning the pediment, which was finished but a few months ago, has been remarkably spared, and yet remains suspended upon the tottering walls."

MEXICAN ANTIQUITIES.—There is a curious collection of Mexican antiquities now exhibiting at 57, Pall-mall, consisting chiefly of specimens of pottery. It appears that during the invasion of Mexico by the United States, the government ordered the construction of trenches and fosses for the protection of the city; and it was during the excavations carried on for this purpose that the antiquities in question were obtained by Mr. Young. It is presumed that the waste ground now forming the suburbs of Mexico was originally covered with houses and streets, and that the vases, images, and symbolic sculptures, which have now been resuscitated, were buried by the inhabitants at the time of the Spanish conquest. Serpents appear in the collection throughout, sometimes in a coiled or quiescent state, and sometimes erect, or in conjunction with the effigies of the priests and kings, whose cunning and wisdom it was probably their function to symbolise. The vases are curious, and the variety of pattern is as copious as it is diverse. There is a rude monument of a Teocalli, or Temple, consisting of three stories above the basement, each story being a reversed truncated pyramid. No. 247 is one of the finest of the vases: it represents a large black snake coiled on the back of a tortoise, and holding the head of the tortoise in its mouth: its own coils form a vase. Some of the specimens show Egyptian influence.

THE NEW COMMISSION OF METROPOLITAN SEWERS.—A general court was held on 16th inst. Sir John Shelley brought into special notice a subject to which we have strenuously drawn attention, namely, the fact that the Commissioners of Sewers are virtually and actually not Drainage Commissioners. Mr. Thwaites added a new instance of what we have also pointed out,—that tenants will rather submit to be without drains, and to suffer from all the abominations of cesspools, than set what little *passive* power the commissioners may have to work for the amendment of these crying evils. Something *must* be done about it—that seems very clear. A discussion was then begun on the ventilation of sewers, which continued for five hours, and was then adjourned.——At an adjourned meeting, held on Monday, 22nd, the court agreed, *nem. con.* to adopt the plan of low level sewer and branches for the drainage south of the Thames, proposed by the late Mr. Frank Forster, and for parts of which tenders had previously been obtained. The unanimity which prevailed in a court of incongruous opinions, has been ascribed, to a great extent, to our article of last week.

THE PATENT ARCHITECTURAL POTTERY, HAMWORTHY (POOLE).—On 11th inst. were completed and opened, with ceremonial and feasting, the pile of buildings and machinery at Hamworthy, to be called the "Patent Architectural Pottery," and in which all articles of pottery made use of in facing (or flooring?) houses or other buildings, on improved principles, such as those exemplified by H.R.H. Prince Albert, in the model cottages at Hyde-park, are to be manufactured. The builder of the machinery was Mr. James Gregory, of Kingswood, engineer; and the whole of it was executed by Messrs. Kirk and Co. of Shelton, Staffordshire. The contractors for the erection of the premises were Messrs. W. Curtis, and G. Gollop, of Poole. The buildings, which cover about an acre of ground, were executed under the direction of Mr. R. Scrivener, of Shelton, architect. The engine-house and large chimneys are built of red bricks, ornamented with white. The clay stores and other principal parts of the building are of white bricks, ornamented with red.

EDMONTON CHURCH.—The interior of the 'Parish Church of Edmonton," is now undergoing a thorough repair. As the walls are now stripped of the white-wash, and some parts which have the marks of antiquity, in the material used and manner of building, are now exposed to view, an examination might be useful.

NEW MODE OF PROPELLING STEAMERS.—Davies's patent railway-floats for propelling vessels consist of a series of float-boards inside a chamber or recess let up into the bottom of the vessel—a sort of double-keel one-third of the way along from the stern. These float-boards are carried on an endless railway, in two horizontal lines inside the chamber. When propelling they are vertical, and they return above horizontally to renew their action, and then offer but little resistance to the water. Thus, half the number are always propelling. The float-boards, in changing their position, "feather" without jerk or blow, the upper edge going first. As soon as a float-board descends, it acts upon all the water confined in the chamber, and, as it cannot escape by the sides, or above the float-boards, it must necessarily all be carried through the opening at the stern, against the heavy pressure of water from without, or carry the vessel rapidly onward. Competent engineers are said to have admitted that this "confining of the water will give to the action of the float-boards the same effectiveness as if they pressed against a dead-wall."

THE KILKENNY ARCHÆOLOGICAL SOCIETY.—The annual general meeting of the Kilkenny and South-east of Ireland Archæological Society was held in the society's apartments, Patrick-street, Kilkenny, on Wednesday in week before last, the Rev. Dr. Browne in the chair. No less than 35 new members were elected, many of them from Youghal, where a new secretaryship of the society was appointed. The Rev. J. Graves, the hon. secretary, then read the annual report for 1854, which stated that 126 new names, including that of the Earl of Rosse, had been added to the muster-roll since last report. The roll of the society's members now amounted to 536 names; but the objects of the society could not fully be carried out until it at least numbered 1,000. The transactions for 1852, extending to 176 pages, with numerous illustrations, had been issued. The Transactions for 1853, completing the second volume, were nearly ready; whilst the Proceedings and Transactions of the past year, forming the first portion of the third volume, and extending to 206 pages, and largely illustrated, had been completed and issued to the members. Steps had been taken to stamp the Transactions as a newspaper, in order to facilitate their transmission through the post. The report was unanimously adopted. Various articles of archæological interest were then exhibited, and papers were read, by Mr. Prim, on the Ancient Militias of the City of Kilkenny; and by Mr. E. Fitzgerald, the Society's new secretary at Youghal, on the newly-discovered Ogham in the Oratory of St. Declan, Ardmore; and on some Acoustic Vases and other Relics discovered in the Church of St. Mary, Youghal.

THE IRON TRADE.—Writing on 20th inst. the Birmingham trade correspondent of the *Times* says that "the abortive meeting of the makers of pig-iron, held at Wolverhampton on Wednesday (at which nothing was done), has created considerable dissatisfaction among a portion of the trade. It was hoped that the makers would unanimously agree to reduce their produce, but for various reasons dissensions prevailed, and each master, in the end, was left to 'do his best for his own particular connection.' Cold pigs have, it is stated, been sold as low as 5*l.* 5s. if not 2s. 6d. per ton lower, while hot-mine are at from 4*l.* 5s. to 4*l.* 15s. Stocks of pigs are represented to be low in consequence of many of the manufacturers keeping their forges at work while the mills are short of orders. The question of wages, now an important reduction of prices has taken place, has become a prominent subject of discussion; and unquestionably it seems scarcely reasonable that masters should pay for labour, when iron is at 9*l.* at the same rate as when it was 12*l.* per ton. If so, and iron at 9*l.* per ton, with a great increase in the price of raw materials, be remunerative, the profits of the ironmasters when receiving 12*l.* must have been very great." If "masters" *will* persist in pushing up prices beyond all available limits, why should not they be made to *pay for it* in a persistance of the wages which they themselves thus led their workmen to insist upon? "The proceedings at the late preliminary and subsequent quarterly meetings of the trade," continues the *Times* correspondent, "have, without doubt, so far as we can learn, tended most materially to shake public confidence in the decisions of these assemblages. The association is looked upon by a great portion of the trade in the light of a combination; and it is apparent, as upon the present occasion, that, like all other combinations, the resolves of its members, from internal discords, become comparatively inoperative and ineffective even among themselves. However it may have been formerly, the trade generally will not be guided by the prices announced at quarterly meetings, but, like other trades, regulate their rates according to existing exigencies and demand." Our self imposed task, then, of showing up the mischievous and deceitful as well as gambling nature of these meetings, which we have alone steadily done ever since they were in high and universal repute some years since, has at length been happily accomplished.

"A MATERIAL WANTED."—Your correspondent, "S. G. O.," will find Ransome's patent stone such a material for his shop front as will answer his purpose.—T.

SUNDAY TRADING IN LONDON.—Messrs. Rivington, of Waterloo-place, have issued a shilling pamphlet, by "A Layman," in which the extent, evils, and needlessness of Sunday trading in London, as detailed in the Parliamentary evidences of 1832, 1847, and 1850, and other documents, are considered, together with the measures required for its gradual suppression. Besides this useful and readable abstract from tedious blue books, there is a prefatory letter to the Bishop of London, on the subject. The whole, we hope, may be of some service in putting an end to a great evil. The author himself is hopeful that a moderate bill for the suppression of Sunday trading may be passed by Parliament before the present year is at an end.

THE WATER-WORKS AT HAMPTON.—By an Act passed in 1852, the Metropolitan Water Companies are compelled to make certain changes in the service and mode of supply within a certain limited period. The West Middlesex, the Grand Junction, and the Southwark and Vauxhall, have their new works contiguous to each other, on the north bank of the Thames, immediately above the village of Hampton, 22 miles above Vauxhall-bridge. From this point the water is brought by the companies to their several works for deposit, filtration, and distribution by three great mains—two of 36 inches and one of 33 inches diameter. These mains are together capable of bringing 60,000,000 gallons in the twenty-four hours. The *Illustrated News* gives a view of the works, and the following particulars:—"As far as the village of Twickenham the mains lie side by side: there the Grand Junction main diverges through Isleworth and Brentford to the works of that company near Kew-bridge. The two other mains, after being taken under the bed of the Thames at Richmond, separate at Sheen. The West Middlesex main goes through Mortlake to their reservoirs of deposit and filtration at Barn Elms, on the Surrey bank, opposite to, and connected by a main under the Thames with, their works at Hammersmith. The Southwark and Vauxhall main continues through Putney and Wandsworth to the site of that company's works in the new park at Battersea. The length of the mains respectively is as follows:—The Southwark and Vauxhall, 13¼ miles, or 23,000 yards; the West Middlesex, 8¼ miles, or 15,000 yards; the Grand Junction, 7¼ miles, or 13,500 yards. The aggregate area of the sites of the works of the three companies, at Kew-bridge, Hammersmith and Barn Elms, and Battersea, is 120 acres. The reservoirs and filter-beds at the works of all the companies are completed. The engine and boiler houses at Hampton are roofed in, and ready to receive the machinery, a considerable portion of which is on the ground, and now fixing. The length of mains laid on is as follows:—The Southwark and Vauxhall Company, 12,500 yards; the West Middlesex Company, 14,500 yards; the Grand Junction Company, 7,500 yards. In this statement of the mains laid is comprehended the portion of the two 36-inch mains laid under the bed of the Thames at Richmond." The daily delivery of water to London during the last few months, according to our authority, has fallen little short of 100,000,000 gallons.

LECTURE BY LORD CARLISLE, AT BRADFORD.—A long-expected lecture "On the Poetry of Gray," by the Right Hon. the Earl of Carlisle, was delivered in St. George's-hall, Bradford, on Thursday evening in last week, on behalf of the Early Closing Association there, and is fully reported in the local *Observer*. A large and respectable audience assembled. The stalls and area were well filled, and included the principal families of the neighbourhood. The attendance in the gallery was only scanty. There were more than 2,000 persons however present. His lordship, in introducing his subject, said,—when I delivered a lecture to your neighbours at Leeds, I chose for my subject the poetry of Pope. I have chosen for my subject to-night the writings of Gray. Why Gray? it may be asked. I have myself admitted, when I had to speak of Pope, that upon the British Parnassus were loftier names than even his. Why, then, do I seem to descend even lower, instead of mounting higher among the sacred band? In the first place, I may feel that to descant adequately upon Shakspere or Milton would seem to demand gifts and powers more nearly approaching to their own, just as to write worthily of Socrates it required no less than Plato. Next, the endeavour, with whatever success, has been much more frequently made; and besides, the strongest personal impulse I could feel led me first of all to Pope, next to Gray; and I am quite confident that he is worthy enough for you to hear, and more than worthy enough for me to speak about. If I was forced to compare his style and genius with those of any other great writer, I believe I should select Virgil,—the same unerring delicacy of taste,—the same appropriate but not exaggerated loftiness of diction,—the same elaborate and exquisite workmanship. Sir James Mackintosh says that "Of all English poets he was the most finished artist."

WORKSOP ABBEY GATEWAY is one of the oldest examples of architecture, and forms one of the chief objects of interest in the neighbourhood. The building consists of one large room over the archway, and which is now used for the purposes of a Sunday and day school. The walls are composed of magnesian limestone, of which material the church adjoining was formerly built; and it is to be regretted that the repairs which took place some few years back, could not partake of the same character. As I have ineffectually endeavoured to ascertain who the architect was, and the precise date, I should be glad to obtain through your columns some particulars as to its origin.

F. M. B.

AMERICAN PATENTS.—From the usual lists published in the *Journal of the Franklin Institute of Pennsylvania*, we glean the following recently announced:—For an Improvement in Machines for carving Marble, Stone, &c. William J. Casselman, Assignor to Elias A. Swan, Vernon, New York. Claim.—1st. Adjustable blocks on a revolving wheel for determining the position of the cutting-tool, either horizontally or vertically, in combination with a revolving or reciprocating bed. 2nd. Communicating motion from a pattern wheel or wheels, with adjustable patterns, both on the circumference and on the sides, to the sliding-tools, by means of levers so set and operating as to place the said tools in the required position as the parts move, as specified. 3rd. A cutting tool or tools with blades or tools attached to the bottom and side of the stock, which stock is so fitted as to receive a rotary motion, to operate as specified.——For an Improvement in Bridges. Samuel Champion and Thomas Champion, Washington, D.C. Claim.—The combination of tubular braces or struts, made smaller by gradation, or tapering as they extend from the pier or support, with suspension-rods also made smaller by gradations, or tapering as they extend from their pier or support. Also the arrangement of oblique struts between the centre post and horizontal strut, and of the suspension-rods placed in lines radiating from a common centre, in such manner that each suspension-rod shall extend from the top of the column or post over the pier or support, to the foot of one of the clamp-posts, while each oblique strut shall extend from the foot of the post over the pier to the head of each clamp-post. Also the construction of tapering tubular struts of bridges of not less than two concentric sheets or thicknesses of metal, the sheets of each layer abutting, and those of one layer breaking joints with the next. ——For an improved Mode of securing Staples to Walls. Jordon L. Mott, Mott Haven, New York. Claim.—Forming the anchor of a block cast on to the shank of a wrought-iron staple or eye, and provided with a thin wing having flanches or ribs all cast and forming one substance with the block, whereby the cast-iron part shall hold the shank firmly, and at the same time become an integral part of the masonwork, and be firmly held therein by the superincumbent weight.——For an Improvement in Windows. Mark A. Heath, Providence, Rhode Island. Claim.—Inserting, in either side of the sash, a flexible expanding strip, formed in lengths, jointed or otherwise pliantly secured together, so that the sash is made to slide smoothly in the frame, the several lengths of the strip expanding and contracting to accommodate themselves to inequalities in the grooves in which they slide, for the purpose of forming a close joint between the sash and the frame.

COLCHESTER CEMETERY COMPETITION.—At a meeting of the Burial Board, held at the Town-hall, on Monday, the 15th instant, after an examination of the plans (twenty-four in number), the designs of Messrs. Law and Edwards, of London, were finally decided upon.

LONDON AND BRIGHTON RAILWAY.—The progressive increase of traffic on this railway during the last few years, says the *Brighton Gazette*, has produced a corresponding increase in the extensive works at the Brighton terminus. Several new shops have been built, and there is still further call for an extension of the works, which will be carried out as soon as sufficient space can be procured. In 1847 the company were paying about 700*l.* per week for wages; now they are paying more than double that amount, the number of workmen exceeding 1,000. All the carriages and the locomotive engines are manufactured in Brighton. Some of the best workmen in England are employed there. During the past year ten new engines have been built, and it is expected that the number to be finished this year will far exceed that of last year. Latterly, there has been a great improvement in the second-class carriages, cushioned seats and backs being introduced, and they are also much more commodious than the old pent-up second-class carriages. Even in the first-class carriages a considerable improvement has been shown by the space between the seats. There is one interesting feature connected with these railway works, and that is the library, which is supplied with above 2,000 volumes. In this establishment the men and apprentices have an opportunity of learning writing, arithmetic, and drawing: each Saturday evening a concert takes place for their recreation; and, since the opening of this library, the entertainments afforded by the company, by means of an instrumental band and a stringed band, &c. have had the effect of weaning many a man from the low and more grovelling attractions of the beer-shop. The subscription is low, only 1s. 1d. per quarter. The Great Western Company, we believe, started the idea of forming a library for the workmen, and we understand that there are only a few stations where the example has been followed.

THE JERSEY GALLERY OF ART AND SCIENCE.—At a general meeting of the subscribers to this gallery, held on Friday week, under the presidency of Dr. Brohier, Mr. H. L. Manuel, the treasurer of the Institution, according to the *Jersey Times*, produced a report, which showed a considerable falling off in the number of subscribers, and a financial deficit of above 30*l.* It was resolved unanimously, to make an appeal to the good taste and intelligence of the community, in favour of the Institution; or failing that, to petition the States to vote an annual sum in aid, or take the Institution under their own absolute control—its antiquities, pictures, &c. &c. to be placed under their exclusive keeping; otherwise the property to be sold to pay the debts.

LECTURES AT MARYLEBONE LITERARY INSTITUTION.—Mr. Luke Burke, the editor of the *Ethnological Journal*, is delivering a course of lectures on interesting subjects at this Institution. The first related to Cyclopean monuments of Southern Europe and Asia Minor, which in his opinion prove Greece and Italy to be older than Egypt. The lecturer's views are curious and worth hearing. His next was to be on 25th inst. and the last on 1st proximo.

PROPOSED AMALGAMATION OF THE METROPOLITAN GAS COMPANIES.—A Parliamentary Bill, we hear, has been printed, whereby it is proposed to amalgamate the metropolitan gas companies, who, on its passing into law, will of course distribute the several districts of gas-consuming metropolitans amongst themselves respectively, so as to avoid mutual competion, and appropriate the whole, as if it were so much territory acquired by conquest, which they could tax as they pleased, for their article of manufacture, at least till the electric or some other new light "puts out the gas."

THE STANLEY LIBRARY AT LYNN.—This library was opened on Monday in last week, and, as anticipated, there was a considerable run on the stores of literature and science thus placed at the command of the public. The department of novels and "light reading" of course experienced the greatest pressure; but the supply was far more than sufficient to meet the demand of 250 applicants. On the Tuesday, only about fifty or sixty subscribers applied. The library and reading-room have both been fitted up comfortably. The walls are hung with a selection of Wyld's largest and best maps; and a pair of globes are proposed as an addition to the useful and ornamental furniture of the library.

TENDERS

For new Jubilee Schools, about to be erected at Walworth, for Rev. George Clayton; Messrs. Habershon, architects:—

Rowland and Evans	£1,640	0	0
Cooper	1,498	0	0
B. and C. Hayne	1,449	0	0
Clever and Stanger	1,420	0	0
Harmer	1,384	0	0
Wilson	1,365	0	0
Thompson	1,330	0	0
Tolley	1,277	0	0

For finishing a house at Reigate, for Mr. Samuel Jackson. Quantities supplied by Mr. Jarvis:—

Gammon	£1,495	0	0
Ryder	1,460	0	0
I'Anson	1,376	0	0
Wilson	1,270	0	0
Colls and Co.	1,249	0	0
Tarrant (accepted)	999	0	0

TO CORRESPONDENTS.

"*Roofs of Farm Buildings.*"—Could you or any correspondent suggest any idea to supersede the present system of roofing with wood and tiles or slates for farm buildings? After high winds we have slates blown off, or the timber (often cut on the property) settles, or shrinks, or rots. Is there any sort of brickwork with bricks shaped so as to act as roof and tiles? (Farm buildings have been erected covered with hollow-brick arches, we believe satisfactorily).

"H. and Co." Copenhagen (we shall be glad to hear from A. P. H.). "T. B." "Mr. W." (received), "J. R." "Mechanicus" (such proportions can not be *guessed*; they must be worked out), "R. H." "J. G." "E. G. and Co." "W. W." "G. H." "C. and Co." "F. and H. F." "W. H." (thanks), "G. B. W." "C. W." "E. L. T. (we do not propose to print remainder; note shall appear), "S. F." (we shall try to pay a visit some night), "G. G." "M. T. O'K." "E. D. H." "J. M." "Non-competitor," "G. W." "J. M." (at Crystal Palace), "S. C. F." (we have received a statement to a different effect), "Pro Rata" (is in type), "X. Z. Y."

"*Books and Addresses.*"—We are forced to decline pointing out books or finding addresses.

ADVERTISEMENTS.

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